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A STUDY OF THE RELATIONSHIP BETWEEN THE PERCEPTION OF MUSICAL PROCESSES AND THE ENJOYMENT OF MUSIC.

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STUDENT RECOGNITION OF THEMES IN MUSIC THAT WERE REPEATED OR ALTERED THROUGHOUT 14 MUSICAL ITEMS WAS MEASURED BY USE OF AN AUDIOVISUAL TESTING DEVICE. AFFECTIVE RESPONSE TO THE THEMES WAS INDICATED, USING A SEVEN-POINT SCALE OF LIKE-DISLIKE. ASSOCIATIONS BETWEEN THE MEASURED RECOGNITION AND SUCH ITEMS AS MUSICAL EXPERIENCE, ACADEMIC APTITUDE, AND MUSICAL PREFERENCES WERE EXAMINED. THE ANSWER BOOKLET FOR THE TEST CONTAINED A QUESTIONNAIRE TO GATHER DATA ABOUT EACH SUBJECT'S MUSICAL EXPERIENCES AND PREFERENCES. CUMULATIVE GRADE POINT AVERAGES WERE OBTAINED FROM SCHOOL RECORDS. THE TOTAL SAMPLE TESTED INCLUDED 1,572 COLLEGE AND UNIVERSITY STUDENTS, BOTH MUSIC AND NONMUSIC MAJORS IN FOUR MIDWESTERN STATES, AND 342 HIGH SCHOOL STUDENTS IN MICHIGAN. RECOGNITION SCORES AND OTHER DATA WERE GATHERED AND STATISTICALLY TREATED. RESULTS INDICATED THAT RECOGNITION SKILLS SEEMED TO BE (1) SIGNIFICANTLY ASSOCIATED WITH PARTICIPATION IN MUSICAL ACTIVITIES EXTENDED OVER LONG TIME PERIODS AND (2) ASSOCIATED WITH LISTENING EXPERIENCE. RECOGNITION SKILLS DID NOT SEEM TO BE ASSOCIATED WITH OVERALL ACADEMIC APTITUDE, NOR WITH THE TOTAL AMOUNT OF ACADEMIC STUDY IN COURSES OF MUSIC THEORY, HISTORY, AND LITERATURE. STATISTICALLY SIGNIFICANT BUT LOW, POSITIVE CORRELATIONS WERE FOUND BETWEEN (1) RECOGNITION SKILLS AND EXPRESSED PREFERENCE FOR CLASSICAL MUSIC, AND (2) THE RECOGNITION SCORE ACHIEVED ON MOST TEST ITEMS AND THE DEGREE OF LIKING EXPRESSED FOR THE MUSIC OF THE ITEMS. THE AUTHOR SUGGESTED THAT THE PROJECT FINDINGS WOULD PROVIDE TENTATIVE DIRECTION IN PLANNING CURRICULUMS TO ENHANCE ACHIEVEMENT IN AND APPRECIATION OF MUSIC. (AL)

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George L. Duerksen

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G.L.D.

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CHAPTER I

INTRODUCTION

Purpose of the Study

The purpose of this study was to investigate the recognition of musical themes as they are repeated or altered throughout musical works. Such recognition was measured by use of a specially designed test. The associations between such recognition, as measured, and musical experience, academic aptitude, musical preference, and reported affective response to the music of the recognition test items were examined.

Background of the Problem

The offering of music courses in the public schools of the United States has been justified variously on the basis of intrinsic and extrinsic values. When school music was recommended to the Board of Education in Boston in 1837, extrinsic values of music for developing the intellectual, moral, and physical characteristics of the students were mentioned.[1,2] In 1953, a list of functions which music should serve in the public schools was published in the Bulletin of the National Association of Secondary School Principals.[3] Among the functions listed were the development of the social aspects of life, contribution to the health of students, development of good work habits, development of wholesome ideals of conduct, development of good citizenship, and development of recreational skills. In 1955, the Music Educators National Conference published the statement that

". . .one of the most important contributions music education can make in our curriculum is one of education for citizenship."[4] Musical performance groups have served public relations functions for many schools..

Along with such extrinsic purposes, there have been intrinsic purposes for having music in the school curriculum.[5] Evidence accumulating in the behavioral sciences seems to indicate that artistic, or aesthetic, behavior is a particularly important characteristic of the human being. The strength of this evidence has led some scholars to postulate a human need for aesthetic expression. Masserman states that "all organisms are actuated by their physiologic needs, including those leading to esthetic expression. . . ."[6] Music provides one avenue of aesthetic expression, and its adaptability and sensory pervasiveness make it one of the most useful arts for the development of abilities for aesthetic expression among the students of a system of universal compulsory education.

One of the purposes of the process of formal education in most societies has been to convey to the younger generation that part of the cultural heritage that cannot be adequately learned by informal means. Music is an important part of the cultural heritage of Western civilization. Its importance is shown by the way in which it pervades almost every aspect of contemporary life, and particularly those ceremonial functions which are regarded by society as being the high points of human existence. Skills in performing and listening to that music which is regarded most highly by knowledgable members of Western civilization are not easily learned by informal procedures. Thus it falls to the system of formal education to convey these skills to the younger generation.

In the exigencies of teaching in the public schools, many music educators have developed programs that tend to emphasize extrinsic purposes and to neglect intrinsic purposes of music education. However, critics have described some of the dangers which attend school music programs that are based solely upon extrinsic purposes and are justified solely by extrinsic accomplishments.[7,8] Such criticisms, current social emphasis on scholastic excellence, and the quest for "quality education" are among causes which have led music educators to devote increasing attention to programs of instruction based upon intrinsic purposes for the teaching of music.

This increased attention to intrinsic values has led to renewed interest in teaching for the development of sensitivity to, and appreciation of, art music. Some procedures of music education based on these purposes are intended to help students develop skill in recognizing and discriminating tonal relationships in music. Because the music educator aims to help students to develop such skills in listening to music, the investigations of hearing tones and tonal relationships that have been made by music psychologists and others are pertinent to music education.

Tonal Relationships and Music Appreciation

Although the musics of different cultures have differing structures, there is no music that does not have some sort of tonal relationships.

> Music is not a chaotic conglomeration of sounds, but . . .consists of sounds arranged in orderly manner according to numerous obvious principles as well as

> to a still greater number of subtle and hidden relationships which evade formulation. . . . Even the simplest melody shows relationships of pitch (intervals), of time values (rhythm), of groupings (phrases), etc., in other words, has "form."[9]

There are various beliefs about the qualities, functions, and ultimate purposes of art, but there seems to be general agreement that one of the major characteristics of all objects of art and all works of art is the appearance of formal relationships. Some educators and philosophers who have devoted thought to the problems of music education believe that the aim of teaching sensitivity to, and appreciation of, music can best be accomplished through attention to the tonal relationships exhibited in musical form.[10,11] Broudy says,

> Unless the listener detects form, he is limited to the most rudimentary level of appreciation. . . . Hence. . .the ability to detect form is the heart of musical appreciation.
>
> . . . .
>
> It would seem that music education can and should make the listener more discriminating and sophisticated with respect to musical materials and musical forms in both the broad and the narrow sense of the word.[12]

The tonal relationships available for detection in music are not limited to the relationships between pairs of single tones, but include tones in complex melodic, harmonic, and rhythmic patterns. These tonal complexes, sometimes called musical ideas, are repeated, manipulated, and developed within musical compositions. Woodworth says that among the major topics for attention in the study of music, the "most important of all /is/ the manipulation and development of musical ideas."[13]

The music appreciation that many music educators hope to develop in their students has a number of aspects. One of these aspects has to do with affective response to, and particularly liking of, music. Although documented evidence of such a relationship is lacking, some authorities seem to believe that the recognition of tonal relationships is closely related, perhaps in a causal way, with affective response to, or liking of, music.[14,15,16,17] Some of the data gathered in the present study are of use in evaluating such a belief. Another aspect of music appreciation has to do with judgment and evaluation of music. In this area of music appreciation, the recognition of tonal relationships is believed to be of use in the evaluation of music. "What it does is to increase our power to understand what it is we truly enjoy, and to achieve more control over our activities which bring enjoyment."[18] The development of skill in the recognition of tonal relationships seems to be important in the accomplishment of both aspects of music appreciation. The data gathered in the present study provide some evidence of how well the present system of secondary school music education accomplishes the development of this skill.

Tonal Relationships in Music

Because music is a temporal art, a listener cannot hear an entire musical composition instantaneously. During the performance of a musical composition a variety of tonal relationships is established. There are relationships between individual tones, and extended relationships such as those of melody, harmony, rhythm, timbre, and musical form (in both its restricted and its general meaning).

In the forms of art music in Western civilization, one of the major elements is the repetition and alteration of thematic materials. Specific musical forms such as the strophic and ABA song forms, the rondo, the fugue, the sonata-allegro, and the theme and variations are based upon repetition and alteration of themes. Musical sophisticates sometimes use what they regard as subtlety of the treatment of thematic materials as one of the criteria for judgments of musical greatness.[19] If this is a valid criterion for musical greatness, a musical work cannot achieve this greatness for a listener unless he is able to recognize the subtlety of the musical themes and their treatment. According to Hartshorn, ". . . the recognition of repeated phrases or larger sections of a composition, whether in identical or altered form, is a basic requisite to the solution of the greatest problem in musical understanding for the listener, namely, the understanding of form."[20] In any case, virtually all of the music of Western civilization involves repetition and alteration of thematic materials. When such music is performed, it presents a stimulus which provides an opportunity for listeners to recognize repetitions and alterations of musical themes.

Recognition and Perception

The term, "recognition," as used in this study, involves the following operations on the part of the listener: (1) listening to a musical selection; (2) judging what the first theme of the music is; (3) remembering the first theme; (4) listening to the remainder of the selection and discriminating whether or not its various parts are exact or altered repetitions of the first theme; and (5) marking the answer sheet according to the test instructions. A person who has performed these actions is considered to have recognized exact or altered repetitions for the purposes of this study. Definitions of the word, "recognize," in Webster's Third New Unabridged Dictionary make use of the word, "perceive." The term, "perceive," however, seems to be highly ambiguous. Investigation of various writings by Bartley,[21] Allport,[22] Taylor,[23] Koch,[24] Solley and Murphy,[25] and Locke,[26] shows that the terms, "perceive" and "perception," are used by different persons to stand for a wide variety of activities or events. The lack of a common usage of these terms became apparent in the preparation of Chapter II of the present study; a variety of studies were reviewed which used the terms, "perceive" and "perception," to mean many different events.

In one sense, "perception" has become a generic term under which are subsumed events ranging from stimulation of sensory organs to complex cognitive activities. Zener and Gaffron, after analyzing a number of research studies concerned with "perception," stated that in research operation the phrase "the observer (O) perceives X" seems to be used with four different meanings.

1. O discriminates X, in the sense of reacting differentially to X as distinguished from Y.
2. A cognitive process is occurring in O, a process whose properties stand in a certain relationship of appropriateness or "behavioral correspondence" to some external X.
3. A process with the experiential property or properties X occurs in O.

> 4. A specific kind of behavior has occurred as the result of some stimulation by an external object or event.[27]

The authors of this analysis suggested that research in perception would be improved if these various meanings were clearly differentiated in the design and reporting of studies.

In the present study, subjects were required to recognize musical themes when the themes were repeated or altered during the course of a musical work, and to indicate the recognitions on answer sheets. Thus meaning number four, as listed by Zener and Gaffron, is of particular pertinence. The subjects exhibited (or failed to exhibit) a specific behavior as the result of stimulation by an external event. From data gathered in this manner it is possible to infer that perceptions, as defined in the other meanings listed above, have occurred.

Values of the Study

Chapter II reveals that investigation of the recognition of tonal relationships in complex musical stimuli is in the exploratory stage. While data are available about listening to isolated tones and musical fragments, little is known about the recognition of tonal relationships in musical compositions. The present study provides further exploration of the latter area. It also provides tentative direction for music educators interested in planning music curricula which will better enable students to recognize the nuances of complex musical stimuli. The data are of use in evaluating beliefs about the relationship of recognition of tonal relationships in music and affective response to, or liking of, that music.

The procedure in the present study is similar to that described by Guba[28] as an "investigation." Its purpose is exploratory rather than definitive. Although the results of the study neither provide norms nor provide definitive evidence of the causes of the recognitions which are measured, they do provide suggestions for further investigation, both in the form of normative studies and experiments to discover causal factors. ". . .if we mean findings which are suggestive rather than conclusive, heuristic rather than definitive, we may have a great deal to learn from such an inquiry."[29]

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CHAPTER II

RELATED LITERATURE

Listening to Musical Stimuli

Research about listening to music, in attempting to isolate variables, has tended to be concerned with various stimuli abstracted from the complex musical stimulus rather than with listening to music *per se*. Helmholtz[1] and Stumpf[2] used the word "tone" rather than "music" in their book titles, because their pioneering work was concerned with isolated tonal stimuli rather than with musical compositions. In 1923, a review of the literature led Diserens to conclude that

> Since many of the experiments deal with reactions to relatively simple elements--isolated tones, intervals, chords, etc.--it seems preferable to speak of reactions to musical stimuli, rather than of response to music.[3]

Since 1923 many more studies of reactions to isolated tonal stimuli have been done. Such studies depend primarily for their results on the autochthonous properties of the nervous system.[4] They are investigations of hearing that are influenced primarily by genetic capacity rather than by learned skills in the use of that capacity. However, the stimulus of isolated tones and that of complex works of music differ greatly from one another. The work of music presents simultaneously, and in temporal succession, elements of harmony, melody, rhythm, and timbre in complex relationships. Listening to such a work of music, although based upon genetic capacity, involves the use of learned skills developed within that capacity.

> Although the autochthonous aspects of the perception of musical sound underlie the most complex and idiosyncratic responses to music, they can do little to explain even a relatively simple musical response.[5]

The genetic capacity of each individual is unique. Learning, through which skills in the use of genetic capacity are developed, also differs from individual to individual. In spite of these differences, there are similarities in the genetic capacities of human beings, and there are similarities in the learning processes within a given group, society, or culture. Thus, it seems reasonable to expect some similarity in listening to music among human beings who are members of given cultures or groups.

> Unique as the total pattern of experiential determinants may be, it is also empirically evident that the individual's responses to music are not unique in every respect and that certain gross aspects of his responses to particular kinds of music may be similar to or identical with those of groups of other individuals.[6]

Recognition of Tonal Relationships in Complex Musical Stimuli

There are some studies in which the recognition of tonal relationships in complex musical stimuli has been investigated. One of the earliest of these studies was made by Weld.[7] Phonograph recordings of music were played for the subjects, who were asked to give a report of their experience elicited by the music. Weld found that some of his subjects detected the recurrence of motifs and melodic patterns in the musical stimuli.[8] This study was not well controlled nor statistically validated. The date of the study (1912) may be interpreted to mean that the fidelity of the recorded musical stimuli was not adequate;

however, the study is of historical interest.

More recent studies include Brehmer's[9] investigation of the recognition of melodic variations by children. Subjects for this study were 76 German school children ranging from about 6 to 13 years of age. There were 33 boys and 43 girls among the sample. A Volksschule provided 44 subjects while a private school provided the other 32 subjects. Pairs of melodies, each of which was two measures in length, were played for the students. The students were asked to judge whether or not the second melody of each pair was based on the first melody of that pair. Variations ranged from the alteration of a single tone diatonically or chromatically to the alteration of three tones, including the final tone, of a five tone phrase. The melodies were not harmonized.

In one section of this study, melodies that were well known to the students were used as the first part of each stimulus pair. It was found that twenty percent of the children six years old recognized all the variations correctly, while thirty percent of this age group failed to recognize any of the variations correctly. A gradual, but very irregular, increase in percentage of correct identifications was found in groups at increasing age levels. Correct identifications of all variations were made by 100 percent of the 10- and 13-year-old students. The scores of individual subjects seemed to indicate that the recognition of such variations of a melody is an all or none phenomenon.[10] In another section of this study, recognition of variations of unknown melodies was measured. Although lower percentages of correct identifications were found in this section, the same progression of increasing percentage of correct identifications was found for groups at increasing age levels.[11]

Francès[12] (1952) made a study of the recognition of formal structure in a three part (ABA) song form. The Schubert Impromptu, Opus. 142, No. 2, was used as the musical stimulus. In this music there are differences in rhythm and in melodic phrase and its repetition between the A and B sections. Subjects for the study were 60 males, aged from 16 to 20, who had had no theoretical musical training, but most of whom were regular concert-goers. There were also 10 professional musicians, aged from 25 to 55, who were used as subjects. The subjects were seated in a large auditorium, and separated by panels so that they could not see each other. For each subject there was an observer. Each observer was seated so that he could see his own particular subject and a large clock which was located at the rear of the auditorium behind the subjects. The music was played once, after which the subjects were told that the music had three sections. The music was then played again. During the second playing of the music, each subject was to raise his hand each time he heard a change in section. Each observer noted from the clock the time at which his particular subject had indicated the recognition of a change of section. A similar study was conducted using the "Fugue" from the Chromatic Fantasy and Fugue by Bach as the musical stimulus. In this study the subjects were asked to indicate each time they recognized the re-entry of the fugal subject.

In these studies Francès found that the musicians were able to identify the changes of sections and the re-entries of the fugal subject with great accuracy, while the nonmusicians achieved much less accuracy in these tasks. It was concluded that a person, to make these identifications, requires a technical musical background.

In a further study of the recognition of musical themes in musical context, Francès[13] (1956) tested groups of nonmusicians (Lycée students who had had no musical experience), musical amateurs (Lycée students who had had some instruction in musical instruments or voice), and music students. These groups ranged in size from 18 to 33 members. It was found that music students recognized primary and secondary thematic materials in various aural musical stimuli much better than did the amateur musicians, and the amateurs recognized these thematic materials slightly better than did the nonmusicians.

K. Mueller[14] measured recognition of various aspects of formal structure in a single movement of a symphonic work. A printed list of statements about the structure of this music was given to a group of 117 college students. The students were then asked to listen to three playings of a recording of the music. The subjects were asked to indicate the extent of their agreement with each of the printed statements during each of the three playings of the recording. Extent of agreement was marked on a five point scale ranging from "strongly agree" to "strongly disagree." The split-half reliability of this test was .80.

Scores on this test showed slight relationship with verbal intelligence (r = +.41), slightly more relationship with musical training (r = +.56), and a closer relationship with musical interest and listening experience (r = +.70). Over 75 percent of the subjects correctly agreed with statements such as "there are many repetitions of the sections of the piece" and "the composition is built entirely on repetition, development, and interweaving of original themes."[15] Agreement diminished rapidly on other more specific questions about formal relationships. Even after three repetitions of the music, fewer than half of the subjects recognized that there was no introduction before the main theme in the music. Fewer than a fourth of the subjects identified the rhythm as three beats rather than four beats to the measure.[16]

In general, some progressive refinement was found in the recognitions indicated by the subjects while they were listening to the second and third presentations of the music. This finding may, but does not necessarily, contradict Brehmer's finding that the recognition of variation in melody seems to be an all or none phenomenon. In Brehmer's study, attention of the subjects was directed to the single aspect of melodic variation in pairs of stimulus melodies. In Mueller's study, attention of the subjects was directed to many aspects of musical structure during three repetitions of a complex musical stimulus. It may be that the subjects in Mueller's study were not able to make all the discriminations required during the first hearing of the music, but made those for which they had time on an all or none basis. However, the repeated listenings may have provided the subjects an opportunity to refine the discriminations they had made of single musical elements during the first hearing of the music.

The studies reviewed thus far reveal that some persons listening to music seem to make recognitions of the type under investigation in the present study. The subjects in Weld's study indicated that they recognized re-entries and developments of motifs in musical works. Brehmer found that school children were able to recognize some variations of melodies, with the number of correct recognitions increasing approximately in proportion to the increase in the age of the subjects. Francès found that some subjects recognized changes in section in an ABA song form, recognized re-entries of main subjects in a fugue, and recognized primary and secondary themes when those themes occurred in aural musical stimuli. Subjects in a study by Mueller correctly identified some structural characteristics of a musical work, and the number of correct identifications of the characteristics seemed to increase with repeated hearings of the music. Even after three hearings of the music, however, many of the subjects made incorrect identifications.

Musical Experience and the Recognition of Tonal Relationships

Recognition of tonal relationships in musical stimuli may depend to some extent on learned abilities. It therefore seems likely that experiences in music which provide the opportunity for learning to take place may have some influence on the development of the skill with which tonal relationships are recognized. However, studies of the relationship of musical experience and the recognition of tonal relationships have resulted in varied conclusions. The studies by Francès, which were described previously, showed definite relationships to exist between musical experience and measured recognition of tonal relationships. Of the studies reviewed in the present section, there are some that demonstrated definite positive relationships between these two factors, while others showed low, negligible, or no relationships between them.

Some of these differences were probably caused by the different kinds of "musical experience" investigated in the various studies.

The entire system of music education is based upon the assumption that musical skills can be improved. Langford[17] undertook a study to validate the belief that skill in taking melodic dictation is improvable. In taking melodic dictation, the listener must attend to the aural musical stimulus and convert it into notational representation. Three groups, matched on the basis of the Drake and Seashore musical aptitude tests, were formed from students enrolled in college "ear-training" classes. During one semester the first of these three groups practiced melodic dictation for 10 hours, the second group for 20 hours, and the third group for 40 hours. A test of melodic dictation was administered to all three groups at the beginning and at the end of the semester. Scores achieved by the three groups were compared through the statistical technique of analysis of variance.

It was found that the mean gains within each group were statistically significant, but no statistical significance was found between the amount of time practiced and improvement. The group which practiced 20 hours had a higher mean gain than did the other groups. This result was attributed to uncontrolled variables such as outside practice time, the amount of sight singing practice, and the amount of practice in rhythmic dictation. It was found that students with more than three years of piano experience tended to improve more than the average of the groups. The results of this study indicate that the relationship which may exist between musical experience and recognition of tonal relationships may not be of the simple, linear type.

Dittemore[18] studied the recognition of variations of known musical themes in musical context. Subjects for this study were 430 secondary school students. The students were taught three musical themes, after which they listened to 24 recorded musical exerpts and attempted to identify upon which of the three themes, if any of them, each exerpt was based. A questionnaire was used to gather data concerning the kind and extent of musical training and experience each subject had had. The analysis of variance and t tests were used in statistical analysis of the data.

Mean recognition scores for students in each grade were found to increase progressively from the seventh through the twelfth grade. With the exception of the difference in mean scores between subjects in grades 10 and 11, the difference between any two adjacent grades was not great enough to be statistically significant. Out of the total possible score of 24, students in the seventh grade achieved a mean recognition score of 13.52, while students in the twelfth grade achieved a mean recognition score of 15.79. This difference was found to be statistically significant. Students who had participated in school music groups, piano and instrumental lessons, and intensive training in music fundamentals scored higher on the recognition test than did students who had not had these musical experiences. Students enrolled in instrumental music or both instrumental and vocal music classes made higher recognition test scores than did students enrolled only in vocal music classes. Dittemore also concluded that

> . . .listening habits were a major factor. While classroom listening had little effect on the test scores of the subjects, their test scores increased

> in proportion to the increase in hours spent listening to music outside the classroom.[19]

Six hundred students selected at random from the total elementary population of the public schools in a large Wisconsin city were tested in a study by Petzold.[20] These students were given tests in which musical phrases were played on the piano, and the subjects were required to repeat the musical phrases by singing. The singing was tape recorded and its accuracy was evaluated. Some allowance was made in scoring for those students who had poor control of their voices. It was found that there were no statistically significant differences between the scores achieved by the boys and the scores achieved by the girls. A slight increase in scores occurred from grade to grade in grades one through six. Petzold said

> There is considerable evidence that age and auditory perception are related if lower and upper grades are compared, but the relationship is not as evident when grades are compared at one- and two-year intervals. It is reasonable to assume that these observed differences result from factors other than age, particularly the cumulative influence the music program of the school has upon the child.[21]

It seems quite possible that other influences may have contributed as much as school music programs to the differences observed by Petzold.

Francès[22] (1954) made a study in which subjects were presented aurally with pairs of isolated melodies. In each pair the second melody differed from the first by the alteration in pitch of a single tone. Melodies of three, six, and nine tones in length were used in this study. In order to eliminate the influence of variable rhythm, the melodies were performed in equal note time values. Subjects were asked to indicate which tone of the melody was altered in the second melody of each pair. A questionnaire was used to gather information concerning the amount of study of music theory, concert attendance habits, musical preferences, age, and occupation of the subjects. It was found that professional musicians made fewer errors than did musical amateurs who had had private instruction in instruments or voice. The latter group made fewer errors than did those subjects who had had no musical training at all.

Fluke[23] constructed a test to measure skills achieved by high school students in several aspects of listening to music. Exerpts were selected from standard musical compositions for use as stimuli for the various test items. There were 30 items each in tests of listening to rhythm, melody, and harmony. A multiple-choice question was asked about each musical exerpt. The musical stimuli were presented aurally. The tests were standardized on 2,314 students who were members of musical performance groups in Colorado high schools. Measured reliability for the test as a whole was .78. From inspection of the norms derived through the standardization process, Fluke concluded that orchestra and band students were more skilled in listening to rhythm than to melody and harmony. Chorus students made poor scores in all three areas.

In a study by Rhinehart,[24] college students with various amounts of musical training listened to four different series of musical selections. The students were asked to rank the items within the first series according to tempo, ranging from the fastest to the slowest. The second series was to be ranked according to complexity of timbre, the third series according to complexity of rhythm, and the fourth series according to complexity of harmony. It was found that there was most agreement about the rankings of tempo, the agreement being in direct proportion to the amount of musical training of the students. There was less agreement about the ranking of harmonic complexity, still less about the ranking of rhythmic complexity, and least agreement about the ranking of complexity of timbre. The higher the level of training of the subjects, the more disagreement there was in judgment of complexity of timbre. The significance of these findings is unclear, for the study was not well controlled in design or analysis.

Rosenkranz,[25] using the Wing tests as a pre-course and post-course measure, found that students who took the Humanities Core Course at Fort Lewis College made an improvement which was significant at the .05 level. He also found a statistically significant relationship between Wing test scores and musical performance experience, musical performance attendance, and listening habits.

From the studies by Petzold, Francès, and Dittemore which are cited above, it seems that persons with musical training tend to make higher scores on musical listening tests than do persons without musical training. These studies, as well as those by Fluke, Rhinehart, and Rosenkranz, indicate that different amounts and different kinds of musical training are associated with different musical listening test scores, although the study by Langford indicates that this relation may not be a simple, linear one.

In a study made by Steward,[26] the Wing tests were administered to a random sample of freshmen and seniors in two liberal arts colleges and two universities in western Oregon. The scores made by these students were compared by use of the Mann-Whitney U test. It was found that there was no significant difference between the scores made by nonmusic major college freshmen and seniors, nor was there any significant difference between the scores achieved by those students who had taken music appreciation courses and those who had not. The students who scored among the highest one-fourth were found to have had "richer musical backgrounds" than had the students who scored among the lower three-fourths. After analyzing the backgrounds of the subjects of his study, Steward concluded that exposure to music principally through informal sources such as radio and television is not sufficient to develop a "high appreciation" for music, and that some individual participation in performance is essential. The impression that "informal exposure" to music does not develop a "high appreciation" for music does not seem to justify a conclusion that such appreciation can be developed only through performance.

In the process of constructing his Cadence and Phrase Tests in Music, Lowery[27] found that there was no difference in the judgment of completeness of cadence between girls who had had up to four years of piano study and those who had had none. Subjects for this study were 50 English school girls. It may be that the influences which develop the ability to make these judgments were so pervasive in the culture in which these girls lived that added exposure through private piano study resulted in no significant increase in ability to make these judgments.

Deihl[28] made a study of the relationships among concept development in music, listening achievement, musicality, and musical experience. Concept development was operationally defined as the ability to abstract the essential generic aspects of musical structure as well as the ability to apprehend and discriminate among varying qualities of musical performance. A verbal test was constructed to measure basic concepts and an aural test was constructed to measure listening achievement. Listening achievement included skill in recognizing and identifying those areas of style and form that are generally introduced in a survey course in music appreciation. Musicality was measured by the Gaston Test of Musicality. Subjects for the study were 184 college students enrolled in music appreciation classes. A computer was used to make an analysis of regression in which partial correlations were determined while holding other factors constant.

No significant relationship was found between concept development and musical performance experience. A low relationship was found between concept development and listening achievement. The following two results must be interpreted in light of the fact that statistical significance can be achieved by very low correlation coefficients; that is, a correlation coefficient may be low and still not be likely to have occurred by chance. The correlation between musicality scores and concept development was low, but statistically significant, as was the correlation between performance experience and listening achievement. The highest listening achievement of the students most experienced in performance was in timbre discrimination. In the areas of vocal forms and periods and styles, the most experienced students failed to do well. Significant relationships were found between performance and musicality scores, and between listening achievement and musicality scores.

Rubin[29] made a study of the effect of musical experience on musical discrimination and preference. Measures of musical discrimination and preference were constructed and administered to a group of 254 students selected from the seventh, ninth, and twelfth grades. The test of discrimination required the subjects to discriminate between pairs of phrases in which either a change of melody, harmony, rhythm, or no change had been made. The test of preference required the subjects to indicate choices between aural presentations of art music, folk music, and popular music. Musical experience was measured by a questionnaire which included 11 categories of experience: private study, class study, home record collection, professional or active layman in the home, church or community participation, dance study, musical radio programs, concert attendance, musical theatre, musical movies, and musical television programs. On the basis of arbitrary weights assigned to these different categories of musical experience, the subjects were divided into two contrasting groups of high and low musical experience.

There was little difference between the musical preference scores, and only limited difference between the discrimination scores, made by the high musical experience group and the low musical experience group. Duda, in a review of Rubin's study, warned that

> One must beware, however, and not draw the erroneous conclusion that musical experiences have little effect in developing ability to make musical discriminations. Rather, one can postulate that the nature of the musical experiences was such that the ability to make musical discriminations was not developed.[30]

Duda's warning may be valid. If his evaluation is correct, then it seems likely that music educators cannot rely on musical experiences of the sort measured in Rubin's study to develop the students' skills in musical discrimination. One of the purposes of the present study is to determine whether or not experience in the various aspects of the formal education program in music (experience which was not measured separately by Rubin) is associated with recognition of certain tonal relationships in music.

The two studies cited next were concerned with the relation of musical experience and discriminations of musical taste. They are pertinent because the present study is concerned with the association of musical preference (a factor in musical taste) and the recognition of repeated and altered thematic materials in music. They are also pertinent because discriminations of musical taste are a part of the general category of listening. These studies lend support to the belief that musical experience does influence skill in listening to music.

Cowles[31] studied the relationship between the performance media of high school students in music and their ability to assess the quality of musical performances. A test of 30 pairs of musical examples was constructed, using instrumental, piano, and vocal music. This test was administered to 400 music students in two southern California high schools. The subjects were asked to choose the best performance of each pair of examples presented in the recorded test. It was found, through the technique of analysis of variance, that the judgment scores of band and choir members did not differ significantly from each other, but that members of both of these groups scored significantly lower than did members of the orchestra. Students with six years of ensemble experience scored significantly higher than did students with less ensemble experience, but there were no significant differences between the mean scores achieved by members of the sophomore, junior, and senior classes. When the subjects were divided according to performance media, it was found that string players scored the highest, followed in order by woodwind players, percussionists, vocalists, and brass players. Students in the upper socioeconomic class scored significantly higher than those in the middle socioeconomic class, while the latter scored significantly higher than did the students in the lower socioeconomic class.

Erneston[32] investigated the effects of musical experience and mental ability on the formulation of musical taste. Subjects for this study were 780 college freshmen in a state school in the Southeast. Musical taste was defined as a combination of attitudes toward music, musical preferences, and musical discrimination. Separate tests were constructed to measure these three aspects of taste. The scores on these tests were converted to standard scores and combined to provide a single score representing musical taste. Information concerning the musical experience of the subjects was gathered by means of a questionnaire. The analysis of variance was used in the treatment of the data.

A statistically significant difference was found between the mean musical taste scores of those students who had not participated in any organized musical activity whatsoever and those who had been active in music. No evidence was discovered linking any particular type of musical activity (e.g., band, orchestra, chorus, music classes, private lessons) with a higher level of acquired taste. Musical taste scores were found to be related to amount of musical experience, both in number of years of participation and in number of musical activities in which part was taken. There was a statistically significant difference between mean musical taste scores when the subjects who had participated in musical activities were divided into groups of high, medium, and low intelligence. When the subjects who had not participated in musical activities were grouped according to intelligence, there was no significant difference between the mean musical taste scores. The interaction of mental ability with variety and amount of musical activity was very high. The highest mean taste score was made by the group of subjects who had the highest level of intelligence and the greatest amount of musical experience.

In the two studies of musical experience and discriminations of musical taste which were just reviewed, Cowles found that different kinds and amounts of experience were associated with differences in judgments of quality of musical performance, and Erneston found that musical taste scores, as measured by his tests, were related to the amount of musical experience reported by his subjects. Erneston also found that the more intelligent students benefitted more from musical experience (in the sense of achieving higher musical taste scores) than did less intelligent students. These results seem to indicate that musical experience does influence judgments of musical taste, and that different experiences and amounts of experience have different effects on these judgments.

Recognition of Melody in Music

Because thematic repetition and variation in Western art music is often based on the manipulation of melodic materials, it is necessary to consider some characteristics of the recognition of melody in music.

> A certain form of pitch excursion may be perceived /in the sense of cognized/ by one individual as a single unified act whereas to another the same pitch excursion may seem chaotic. The former hears "a" melody, the latter none. The criterion is emphatically of a perceptual order, and hence it is markedly subject to training.[33]

In order to recognize repetition and alteration of a theme in music, the listener must first cognize and remember the theme when it is introduced. It seems likely that the ease with which a theme can be cognized and remembered will depend on a number of factors, including the complexity of the melodic sequence. According to Heinlein,[34] the complexity of any melody is related to a large number of interdependent factors (including melodic contour, harmonic imagery, rhythmic complexity), and the nature of the melody is altered by the modification of any one or more of these factors. Mere length is not the only variable which influences melodic complexity. It is also evident that complexity depends upon the listener, for what is complex to one person may not seem so complex to the next.

Black,[35] in a study of oral communication, found that increased noise and increased sentence length reduced correct responses to sentence directions in a series of tasks. He concluded that the length of the sentence and amount of background noise influenced the recognition of the sentences. These results are not directly translatable from verbal into musical terms, but may serve as the basis for some speculation. The length of the musical theme may be roughly comparable to the length of the sentence. Musical "noise," however, in the form of harmony, tone color, texture, and rhythm, may be supporting as well as distracting, whereas random noise in speech communication serves primarily as distraction. It may be that the presence of extra-melodic musical elements may serve to make melodic repetition and alteration more easy to recognize rather than more difficult.

A study of the effects of harmonization on the recognition of melodic fragments in music was made by Ritchie.[36] He concluded that harmonizations often decreased recognition of melodic stimuli to a significant degree. Secondary triads seemed to decrease the recognizability of a melody more than did primary triads. No consistent effect on recognition of melody was shown by the number of chord changes underlying the melody. In his study of children in the first six grades, Petzold[37] found that the presence of rhythm did not seem to influence the recognition of melodic (pitch) items.

Lowery developed a test of musical memory because "the listener is called upon to follow the treatment of the original phrases and he must therefore bear in mind at least the outlines of these phrases."[38] In the administration of this test, each melodic item was played three times for the subjects. Five musical examples were then played for each item, and the subjects were to judge whether or not each example was based on the original melodic item. In a test of 130 English school girls between the ages of 12 and 14, Lowery found that differently transposed melodies were recognized by 60 to 90 percent of the girls. Differently ornamented melodies were recognized by 67 to 89 percent of the girls, while melodies treated by augmentation and diminution of time values were recognized by about 55 percent of the girls. Thus, a very general rating of comparative difficulty of recognition was established.

A small-scale study of the recognition of distorted melodies by White[39] presented nine adult subjects with a written list of titles of commonly known melodies, including "Danny Boy," "Yankee Doodle," and "On a Bicycle Built for Two." These melodies were then presented aurally in normal and distorted versions in random sequence. Distortions in the melodies were made by increasing and decreasing the size of melodic intervals and by alterations of duration. The removal of all pitch information proved to be the form of distortion most disruptive to recognition, but even when all pitch information was removed and only the rhythmic sequence remained, subjects were able to identify

33 percent of the melodies correctly. Elimination of duration differences was one of the least disruptive distortions. If either the relative sizes of intervals or sequences of up and down were changed, the melodies became more difficult to recognize. Temporal reversal of the melodic pattern made its correct identification extremely difficult. Because of the limited number of subjects used in this study, the results cannot be generalized safely.

In a study cited previously, Francès[40] (1954) found that changed tones were located more successfully in shorter than in longer melodies, and in tonal rather than in atonal melodies. Changes were also more successfully located when the tone changed was either the first, the last, the highest, or the lowest tone of the melody.

Gordon[41] hypothesized that because music has logical sequence, coherence, and meaning, it might be memorized at a rate which allows it to rank with significant material rather than with nonsense material in Ebbinghaus type learning tests. In a test of this hypothesis, it was found that the difference between the rates of learning of nonsense materials and musical materials was less than the difference between rates of learning of significant and nonsense verbal materials. Burroughs and Morris[42] made a study in which 100 pupils aged 13 years or more made repeated trials at singing a musical theme after hearing it played on the piano. In this study, four factors were found to be involved in the learning of musical themes. These factors were memory for melody, recognition of musical shape, verbal intelligence and interest, and rhythmic accent. All of these factors, with the probable exception of verbal intelligence, may be influenced by varieties of musical experience.

Melodic and thematic materials vary in their complexity and structure. The evidence presented in the foregoing discussion indicates that these variations in complexity and structure cause variations in the difficulty of learning and remembering these melodic and thematic materials. It is likely that variations in complexity and structure of thematic alterations cause variations in the difficulty of recognizing these alterations.

Because genetic capacity underlies the ability to hear, it is possible that differences in age and maturation may have some influence on listening to music. Hattwick[43] made a study of differential pitch sensitivity among children of different ages. In this study a test of pitch discrimination (isolated from musical context) was developed and administered to 3,902 children ranging in age from three to twelve years. It was found that, while a child of five or seven in some cases had as good a pitch discrimination score as a child of ten, there were fewer children at the younger ages able to discriminate small pitch differences than at the ten year age level. Hattwick concluded that there were only slight differences in discriminative ability at the different age-grade levels investigated in his study.[44] Recognition of minute differences in pitch, such as was measured by Hattwick, is probably dependent more on sensory capacity than on learned abilities. It seems from the results of his study that the sensory capacities upon which pitch discriminations are based are reasonably well matured by the time the child reaches the upper elementary school level.

Academic Aptitude and the Recognition of Tonal Relationships

While there is a paucity of studies concerned with the relationship of academic aptitude and the recognition of tonal relationships in complex musical stimuli, there are several studies of the relationship of intelligence test scores and musical ability test scores. Listening to music is, by its very definition, a musical ability, and intelligence test scores have been found to be reasonably efficient indicators of academic aptitude. Perhaps some inferences about the relationship of the recognition of tonal relationships in music and academic aptitude may be drawn from the results of studies of the association between musical ability and intelligence.

The results of studies of the relationship of musical ability and intelligence have varied with variations in definition and means of measurement of musical ability. When musical ability has been measured by the tests that are based on recognitions of tonal stimuli dependent for the most part on the autochthonous properties of the sensory system, its correlation with intelligence test scores has been low. When measures of musical ability are based on more complex musical tasks, the relationship of musical ability and intelligence seems to be higher. According to Hendrickson and Stratemeyer,

> American studies have found correlations ranging from zero to less than .60 between scores on the individual tests of the Seashore battery and intelligence test scores. . . . European studies have presented evidence that functional musical ability and intelligence are closely related.[45]

Robertson[46] computed a correlation coefficient using the intelligence and musical ability test scores of about 5,000 public school children in six different cities of the United States. Intelligence was measured by the Benet, Kuhlmann-Anderson, and Otis tests, while musical ability was measured by the Kwalwasser-Dykema test. The correlation reported was +.33. Drake[47] studied the relationship of intelligence test scores with scores made on 12 different music tests, including measures constructed by Seashore, Kwalwasser and Dykema, Drake, and Lowery. Subjects for this study were 163 English school boys. Measured correlations ranged from +.07 to +.33. The results of this study, and that by Robertson, indicate the presence of very little relationship between musical ability as measured by these tests and intelligence.

Hollingworth[48] administered five parts of the Seashore battery to 49 children, aged from eight to eleven years, in the New York City public school system. These children had Stanford-Binet intelligence scores ranging from 135 to 190. When the Seashore scores achieved by these children were compared to the norms for children of their age, few differences were found. Hollingworth concluded that her subjects were distributed as ordinary children were in the sensitivities tested.

Lundin,[49] in the course of development of his Musical Ability Tests, found that the correlation between scores on these tests and measured intelligence was less than +.25.

A study involving factor analysis techniques led Fischer and Butsch[50] to conclude that there is a close relationship between the bases of general intelligence and musical aptitude. These investigators analyzed the intelligence and musical ability test scores made by 101 German Volk- and Mittelschule boys and girls who ranged from 10 to 15 years of age. Musical ability was measured by the Seashore tests, while intelligence was measured by a test of number, figure, and verbal analogies constructed by the authors. A factor analysis based on the Spearman "g" factor revealed that

> . . .the "g" saturation for both test series is almost equally clear and pronounced; thus in this regard a close relationship between the bases of musical aptitude and general intelligence may be considered demonstrated.[51]

In discussing measures such as the Seashore tests, Mursell said

> Excellent and refined sensory capacity is in itself no guarantee of effective musical behavior. But extremely poor sensory capacity is a serious impediment to such behavior. Thus the tests reveal handicaps and disabilities rather than positive abilities.[52]

After making a survey of the association between musical aptitude and intelligence, Mursell concluded that "when functional criteria of musicality are employed, musical ability is found to be positively associated with intelligence."[53] O'Brien,[54] basing his speculations on observations of 114 subjects, suggested that there may be some relationship between exceptional tonal memory and intelligence. Four of O'Brien's subjects were found to have memory spans of more than ten successive tones in length. This span was more than four standard deviations above the mean memory span of the group (the mean memory span was about three tones). The Wechsler-Bellvue intelligence scores of the four subjects who had exceptional memory spans ranged from 130 to 155. It is possible that the development of such a span of tonal memory is dependent more on learned ability than on basic genetic capacity.

The recognition of repeated and altered themes in music is a complex task. It involves cognition of repetition and alteration of tonal materials in a harmonic, melodic, and rhythmic complex. Because of this complexity, it seems reasonable to expect to find a positive relationship between the accomplishment of such recognition and the intelligence level of the listener.

It may be that the minimum level of academic aptitude that permits the development of adequate ability to recognize repeated and altered themes in music is lower than the minimum level to be found among college and university students. If this is so, it may be that the variations in intelligence among such subjects in the present study will be relatively unimportant when considered in relation to the other factors which influence the measured recognitions. Anastasi[55] has indicated that measured correlations are influenced by the amount of variability within each of the factors being correlated. Because the variability of academic aptitude among college students is less than that among the general population, any association of recognition test scores and academic aptitude found in this study may be considerably less than that which may exist among the general population.

The Association of Recognition of Tonal Relationships and Affective Response to Music

While there are few studies extant which describe the relationships of specific kinds of musical recognitions and affective response, there are a number of general studies of listening to music and its relation to affective response. Krugman,[56] using a limited number of subjects, found that a positive affective shift could be produced by repeated listenings to a musical stimulus over an extended period of time. This shift seemed to take place regardless of the kind of music being heard. Washburn, Child, and Abel[57] studied the effect of immediate repetitions of musical stimuli on responses of pleasantness and unpleasantness. They used as stimuli orchestral music ranging from serious to popular in style and intent. It was found that responses of pleasantness tended to increase with repetition of the more serious music, while responses of pleasantness tended to decrease with repetition of the more popular music.

Farnsworth[58] has shown that preference for ending patterns in music can be altered by increasing the familiarity of the listeners with those particular ending patterns. Familiarity is a natural result of the repetition of the musical stimulus.

Each of the studies cited above demonstrated that repeated hearings of music were accompanied by affective shift, a shift which was positive in direction in the cases of sophisticated, complex musical stimuli. There was no report of whether or not the repeated hearings resulted in increasing discrimination of the subtleties of the musical stimuli.

Watson[59] has said that the factor which is most likely to cause the affect of a musical composition to change is refined discrimination by the listener. This could explain the relationship between increasing familiarity with the musical stimulus and the shift of affective response. Repeated listenings could enable the listener to refine his discriminations, thus allowing him to discriminate progressively more of the subtleties of the musical stimulus. This might explain the finding by Washburn, et. al., that repeated listenings to popular music tended to decrease the responses of pleasantness. In popular music there is not as much subtlety, in the form of complex variety, available for discrimination. Thus, repeated hearings may offer no new discriminations for the listener, but result instead in boredom and feelings of unpleasantness.

Although the studies cited above indicated that repeated hearing, and thus familiarity, tends to result in a shift of affective response to any given musical stimulus, a study by Sopchack[60] indicated the presence of some consistency of affective response to given musical stimuli when the second hearing was removed in time six weeks from the first hearing. In this study 500 college sophomores were asked to listen to 15 musical compositions and assign affective qualities to each of them. When the test was repeated six weeks later, a retest reliability of .76 was obtained. The interval of six weeks between tests precluded the likelihood of any affective shift caused by increased familiarity with the stimuli gained through the two test presentations. Sopchack's study seems to confirm the belief that it is the familiarity engendered through the repetition of musical stimuli that is the cause of much of the affective shift in the listener which seems to accompany repetition.

Rubin-Rabson[61] studied the reactions of a group of 70 adults to recordings of 24 musical selections composed between 1750 and 1925. Musical styles represented in these recordings were described as classical, "transitional," and modern. A questionnaire was used to gather information concerning the musical experience, training, and knowledge of the subjects. The recordings were played for the subjects, who were asked to indicate their reactions on a five-point scale ranging from extreme liking to extreme dislike for the music. The reaction of the group as a whole was most favorable to the most familiar music, and diminished in proportion as recognizable melody and form seemed to diminish.

In a study of vision, Terwilliger[62] developed a set of 65 visual patterns of differing complexities. These patterns were presented to 50 female undergraduate college students, who were asked to rate the pattern they liked best with the number seven. They were then asked to choose the pattern they liked least, and rate it with the number one. Each of the other patterns was then to be rated according to the scale established by the first two ratings. It was found that pleasantness decreased as the "absolute magnitude" of the stimulus complexity increased; thus, the more complex patterns tended to be less pleasant than did the simple patterns. It was also found that pleasantness increased and then decreased as pattern complexity became increasingly different from the adaptation level complexity of all the patterns being judged. Although there is no immediate evidence that this same relationship of complexity and affective response holds in music, the history of acceptance and rejection of new styles of music would suggest the possibility that a similar association exists.

Lundin,[63] in the development of his Musical Ability Tests, computed the correlation between scores on these tests and stated intensity of liking for classical music. A correlation of +.30 was found for musicians, and a correlation of +.23 was found for nonmusicians.

From the results of the studies reviewed above, it seems that repetition of a given musical stimulus and the familiarity which results from this repetition causes a shift in affective response to that music. One study indicated that when repetition does not cause increased familiarity with the musical stimulus, there seems to be some consistency of affective response to that music. Favorable affective response to music may diminish as recognizable melody and form (from the viewpoint of the listener) diminish in the music. It also seems that there may be some relationship between the complexity of a musical stimulus and the affective response to that music, with extremely complex music resulting in relatively more dislike than more simple music.

If Watson's conclusion is correct that the most effective way to alter affective response to music is to refine discrimination of the music, then it seems reasonable to expect subjects who discriminate most adequately in their recognition of tonal relationships in music to respond with affect different from those subjects who discriminate less adequately in their recognitions. Lundin's finding that only a low correlation exists between liking for classical music and musical ability indicates that the relationship between musical preferences and the recognition of tonal relationships in music may be very small.

Music has both internal and external meanings; that is, it has internal relationships--those which have been referred to earlier as tonal relationships--and it has relationships with the listener and the rest of his environment. A given listener may have nonmusical associations with a piece of music, and these associations may be the predominant source of his affective response to that music. It also may be that the internal meaning of a piece of music--its tonal relationships--is the predominant cause of affective response to that music. It seems reasonable to expect like or dislike for a given piece of music to result from multiple, rather than single, causes. In a large sample of subjects, the external relationships causing like or dislike should balance each other reasonably well, so that an estimate of the association between recognition of internal (tonal) relationships and affective response can be made.

Restatement of the Purpose of the Study

In Chapter I, evidence was presented that music educators believe one of the objectives of their profession is to enable students to recognize tonal relationships in complex musical stimuli. Many music educators believe that such recognitions and music appreciation are closely related. Music education in the United States is, quite naturally, oriented toward the music of Western civilization, and one of the primary characteristics of this music is the repetition and alteration of thematic materials. In Chapter II, studies were reviewed concerned with the recognition of tonal relationships, its association with musical experience, musical taste and preference, academic aptitude of the listener, and affective response.

The purpose of this study was to investigate the recognition of musical themes as they are repeated or altered throughout a musical work. Such recognitions were measured by use of a specially designed test. The associations between such recognitions, as measured, and musical experience, academic aptitude, musical preference, and reported affective response to the music of the recognition test items were examined. The specific questions that were answered are:

1. To what extent are repeated and altered thematic material in music recognized by freshman, sophomore, junior, senior, and graduate music majors in college?

2. To what extent are repeated and altered thematic material in music recognized by high school students and by freshman, sophomore, junior, senior, and graduate nonmusic majors in college?

3. Is there any significant difference between the mean recognition scores made by music and nonmusic majors?

4. In what way are the recognitions measured associated with experience in different musical activities? Are there any significant differences between the mean scores achieved by groups of students who have participated in the following activities?

    A. Band.
    B. Orchestra.
    C. Chorus.
    D. Band and Orchestra.
    E. Band and Chorus.

F. Orchestra and Chorus.
G. Band, Orchestra, and Chorus.
H. Private Piano Lessons.
I. None.

5. In what way are the recognitions measured associated with different amounts of experience in the different musical performance activities listed in number 4?

6. In what way are the recognitions measured associated with various amounts of experience in listening to music, as estimated from a combined rating of amount of teacher-guided listening experience, amount of unguided listening experience, and amount of recital and concert attendance?

7. In what way are the recognitions measured associated with different amounts of formal study of music in college courses of music theory, history, and literature?

8. In what way are the recognitions measured associated with different levels of academic ability, as estimated by cumulative grade point average?

9. In what way are the recognitions measured associated with musical preferences? How are they associated with preference for classical music, jazz music, folk music, currently popular music, and rock and roll music?

10. In what way are the recognitions measured associated with reports of liking-disliking of the music of the items of the recognition test?

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CHAPTER III

PROCEDURE

Introduction

Tests were constructed to measure recognition of repeated and altered thematic materials in music, and like or dislike of the music in which the thematic materials are contained. A questionnaire was constructed to gather data concerning musical experience and preference. The tests and questionnaire were administered in a series of three pilot tests to evaluate their validity, reliability, and practicality. After the pilot testing and subsequent revisions of the tests and questionnaire, they were administered to a sample of 1,914 college and high school students. The college students in the sample were drawn from Indiana University, the Interlochen Arts Academy (sponsored by the University of Michigan), Kalamazoo College, the University of Kansas, Michigan State University, the University of Ohio, and Ohio State University. The high school students were drawn from a sampling of rural and urban schools, primarily in the state of Michigan. Grade point averages were used as indicators of the academic aptitude of the college students who served as subjects for this study. The data were analyzed by statistical methods including the analysis of variance and the product-moment coefficient of correlation.

Devices for Gathering Data

The tests of recognition and affective response were integrated with the questionnaire so that a single answer booklet would suffice for all three of these data gathering devices. Appendix A contains a copy of the answer booklet and the test instructions.

The test of recognition is composed of sections of 15 musical works written between 1600 and the present day. The items were chosen from those forms of composition that are based on the repetition and alteration of thematic materials. They vary in length, the longest being just over two minutes in duration. The final version of the test of recognition consists of one example selection and fourteen test selections, arranged in the following order.

1. Brahms. Variations on a Theme by Haydn, Measures 1-29.
2. Mozart. Symphony No. 12, First Movement, Measures 1-157.
3. Dello Joio. Variations, Chaconne, and Finale, Measures 1-40.
4. Haydn. Symphony No. 94, Third Movement, Measures 1-60.
5. Prokofieff. Symphony No. 1, Third Movement, Measures 1-41.
6. Diamond. Rounds for String Orchestra, Measures 348-399.
7. Prokofieff. Symphony No. 1, Second Movement, Measures 5-64.
8. Gliere. "Russian Sailors Dance" from the Red Poppy, Measures 26-97.
9. Tschaikovsky. Symphony No. 6, Second Movement, Measures 1-32.
10. Schubert. Symphony No. 2, Second Movement, Measures 1-25.
11. Walton. Variations on a Theme by Hindemith, Measures 1-32.
12. Haydn. Symphony No. 96, Fourth Movement, Measures 1-48.
13. Elgar. Variations on an Original Theme for Orchestra (Enigma), Measures 1-40.
14. Mozart. Symphony No. 13, Fourth Movement, Measures 1-123.
15. Kodaly. Peacock Variations, Measures 18-54.

Administration of the test required the use of a stereophonic tape playback system, a Kodak Programmer No. 1, a Kodak Carousel 800 slide projector, and a specially prepared series of slides. The musical test items are recorded on channel 1 of the stereo tape. An impulse of 6.5 kilocycles is recorded every 2.35 seconds on channel 2 of the stereo tape. When the tape is played, each impulse recorded on channel 2 actuates the programmer, which in turn causes the projector to advance to the next slide in its magazine. The slides are prepared so that a series of numerals, beginning with the number "1", is projected while the music of the test items is being played. Subjects taking the test are asked to mark on the answer booklet the numeral being projected at the time they recognize any repetition or alteration of the first theme of each item. The synchronization of the projected numerals with the musical stimulus allows the preparation of a key for scoring the test.

The answer booklet provides separate places to mark exact repetitions and altered repetitions recognized in each test item. Thus it is possible to note both the correct and the incorrect recognitions made by each subject. Recognitions are considered to be correct when they agree with those indicated by skilled musicians in analyzing the musical scores of the test items. If there is any change in melody, harmony, rhythm, loudness, timbre, ornamentation, or key, a repetition is considered to be an altered repetition. These criteria for alteration were explained to the subjects in the instructions for the test.

Each item of the test is scored separately. Two points are assigned for each correct identification of a repetition or an alteration of the first theme in each test item. One point is assigned for a repetition identified as an alteration, or an alteration identified as a repetition. One point is deducted for each identification of a repetition or alteration of the first theme when neither occurred at that point in the test item. A total test score is derived by addition of the scores achieved on the individual items.

The test of affective response is coordinated with the test of recognition. After completing the recognition task for a given item, the subjects taking the test are asked to indicate on a seven-point scale their affective responses to the music of that particular item. The scale indicates a range of response from "like very much" (number 7), through "moderate liking" (6), "mild liking" (5), "neutral" (4), "mild dislike" (3), "moderate dislike" (2), to "dislike very much" (1).

The questionnaire is constructed to gather information about musical experiences and preferences, and makes up pages 1 and 4 of the answer booklet. /Appendix A/

Development of the Measures

Of the measurement techniques used in the studies reviewed in Chapter II, those of Mueller[1] and Francès[2] seem to be the most appropriate for the measurement of recognition of repeated and altered themes in music. In Mueller's technique, the listeners are presented with a series of statements about the music with which they indicate the degree of their agreement while the music is being played. With this technique it is difficult to determine the accuracy of recognition within the musical stimuli. A listener may correctly agree with a statement such as "the music contains repetitions of the theme," but the investigator cannot tell whether the listener correctly heard the repetitions or whether he mistakenly interpreted other sections of the music as being repetitions of the original theme.

The measuring technique used by Francès could avoid this difficulty by having the listeners indicate, while the music is being played, exactly when they recognize a repetition or an alteration of the theme. The observer could then note exactly the point in the music at which the listener heard the repetition or alteration. Thus, the accuracy of recognition could be analyzed. However, this method of measurement is rather cumbersome. It is necessary for each listener to have an individual observer, so the testing of large numbers of listeners by this technique would be very difficult. Anastasi[3] has pointed out the values of audio-visual devices in psychological testing. Through the use of a slide projector synchronized with a tape recorder, it is possible to construct an audio-visual device to measure recognition of tonal relationships in music which has the testing advantages, but not the disadvanatages, of the method used by Francès.

First Pilot Study

The first pilot study was planned to develop the testing instruments and procedures. Preliminary versions were prepared of the combined tests of recognition and affective response. Answer booklets for the tests were prepared by the spirit-duplication process, and a preliminary version of the questionnaire was appended to the answer booklet. Appendix B contains the answer booklet for the first pilot study.

Sixteen musical items were chosen arbitrarily for use in the first pilot test. These items were taken from a list of musical selections judged to represent various forms which made use of the repetition and alteration of themes. It was necessary to choose music in which the various treatments of the first theme took place in a short period of time, because the entire test was planned to take a maximum of 50 minutes and it was desired to include as many items as practicable. This time limitation made it necessary to exclude examples of the sonata allegro form, the complexity of which would have resulted in examples exceeding the length desired for the test.

The selections which were chosen represented forms including the song form, the theme and variations, the rondo, and the canon. The selections were recorded in the following sequence, which was determined by the use of random numbers.

1. Kodaly. Peacock Variations, Measures 18-78.
2. Villa-Lobos. Bachianas-Brasileiras No. 4, Measures 1-57.
3. Hindemith. Symphonic Metamorphosis on a Theme by C. M. Von Weber, Fourth Movement, Measures 6-98.

4. Haydn. *Symphony No. 94*, Third Movement, Measures 1-60.
5. Prokofieff. *Symphony No. 1*, Third Movement, Measures 1-41.
6. Diamond. *Rounds for String Orchestra*, Measures 348-458.
7. Prokofieff. *Symphony No. 1*, Second Movement, Measures 5-64.
8. Gliere. "Russian Sailors Dance" from the *Red Poppy*, Measures 26-204.
9. Beethoven. *Symphony No. 8*, Second Movement, Measures 1-56.
10. Tschaikovsky. *Symphony No. 6*, Second Movement, Measures 1-64.
11. Schubert. *Symphony No. 2*, Second Movement, Measures 1-59.
12. Bach. *Brandenburg Concerto No. 2*, First Movement, Measures 1-90.
13. Elgar. *Variations on an Original Theme for Orchestra* (Enigma), Measures 1-40.
14. Mozart. *Symphony No. 12*, First Movement, Measures 1-157.
15. Mozart. *Symphony No. 13*, Fourth Movement, Measures 1-123.
16. Brahms. *Symphony No. 2*, Third Movement, Measures 1-165.

Each of these musical items begins with a statement of the musical theme, none of which has an introduction. The items range in length from one to three minutes, and the running time of the entire tape recorded test was approximately 42 minutes. Each item was announced on the tape by number; at the end of each item there was recorded ten seconds of silence before the number of the next item was announced.

Instructions for the test were printed in the answer booklet. These instructions were read aloud to the subjects before the tape recording of the test was played. The subjects were instructed to listen to the first theme of each item, and during the remainder of that item to listen for repetitions of that theme, either in exact or altered form. When repetitions were recognized, the subjects were to look at the screen, and write the number being projected at the time of recognition on the proper place in the answer booklet. During the ten seconds of silence following the item, the subjects were to indicate the extent of their like or dislike for that music.

The combined test of recognition and affective response was first administered to a group of eleven nonmusic majors who were sophomores or juniors in college. After these students had taken the test and completed the questionnaire, they were queried about their reactions to the test, the individual items, and the questionnaire.

All of these students agreed that the test was too long and that their attention to the items at the end of the test was not equal to their attention to earlier items. It was obvious from the students' comments that the instructions were deficient in clarity and completeness. Several of the students suggested that the instructions should contain an example of a musical theme and its repetition in exact and altered form. The rest of the students agreed that such an example would have been helpful to them in knowing exactly what to listen for in the test of recognition.

Two of the students, when questioned, said that they occasionally had become so engrossed in listening to the music that they had forgotten to make the proper notation on their answer booklets when they heard repetitions of the first theme. They did not believe, however, that this happened often enough to appreciably alter the total scores they achieved on the test. The students were asked whether or not the visual stimulus of the series of numerals being projected on the screen distracted them from the listening task. About half of them said that they did not find the numbers distracting, and the other half said that although the numbers were a minor distraction, they did not believe the distraction serious enough to materially effect their scores on the test.

The same test was then administered to another small group of nonmusic majors who were sophomores and juniors in college. In this administration of the test, however, the investigator interjected in the directions an example, played on the piano, of a theme and its exact and altered repetition. The folk tune "Twinkle, Twinkle, Little Star" was used for the example. Responses of this second group to questioning after they had taken the test indicated that the example was of some help to them in knowing what to do on the recognition portion of the test. Several students suggested that some comment in the instructions about the appearance of material other than the first theme and its repetition would be helpful.

Analysis of the responses to the individual test items revealed that items two and nine were ambiguous and did not contribute adequately to the total test score. Student comments indicated that the first item was particularly difficult for most of the subjects tested. The ten seconds of silence between test items proved to provide adequate time for the subjects to record their affective responses to the music.

Few of the students had difficulty in answering the questionnaire portion of the answer booklet, but it was found that the questions asked did not provide adequate data for use in grouping recognition test scores for analysis.

The validity of such a test is difficult to establish. For most testing purposes, there is no satisfactory substitute for empirical validity, which refers to the relation between the test scores and a criterion which is an independent and direct measure of that which the test is designed to measure. However, there is no criterion available which directly measures recognition of repeated and altered thematic materials in music. Thus, empirical validation of the test constructed for the present study is impossible at the present time. Anastasi[4] has described the method of content validation as being used commonly in evaluating achievement tests. Because recognition of repeated and altered themes in music is a specific achievement, it seems that content validation is an appropriate method for evaluating the test of recognition constructed for this study.[5,6]

Lennon[7] has pointed out that quantitative evidence of content validity cannot be obtained in most situations. In attempting to ascertain the content validity of the test of recognition, four musical experts (college teachers of music theory) were asked to estimate what it was that the test was testing. These teachers read the instructions, listened to the test, and then observed a group of students taking the test. They were then interviewed about the test. These experts agreed that the test scores seemed to indicate the skill with which subjects taking the test did recognize the repetition and alteration of the first theme of each item. There is, however, a factor of intelligence underlying the recognition scores achieved. The listening task is complex; so are the test instructions and the process of marking the answer booklet. In order to achieve a high recognition score, a subject must have some minimal level of intelligence that will enable him to understand the instructions and mark the answer booklet appropriately.

Second Pilot Study

The results of the first pilot study were used in revising the combined test of recognition and affective response and the questionnaire for the second pilot study. The instructions for the tests were revised and recorded on the tape of the test. The musical example, "Twinkle, Twinkle, Little Star," was also recorded. Because they had proved ambiguous in the first pilot study, items two and nine were removed from the test. Several other of the items were shortened so that the total running time of the test was about 36 minutes. The questionnaire was revised for greater clarity, and additional questions about musical experience were included to elicit the data necessary for use in the analyses that were planned. The form of the questionnaire was changed to a coded version that would be more convenient for transferring the data to punch cards for computer analysis. /Appendix C/

The order of the fourteen items was changed to provide a better alternation of long and short items, and physically stimulative and sedative types of music. The exerpt from the Symphony No. 12 by

Mozart had seemed to be a particularly easy item in the first pilot study; this item was moved to the beginning of the test for the second pilot study. The items of the second version of the combined tests of recognition and affective response were arranged in the following order.

1. Mozart. *Symphony No. 12*, First Movement, Measures 1-157.
2. Hindemith. *Symphonic Metamorphosis on a Theme by C. M. Von Weber*, Fourth Movement, Measures 4-98.
3. Haydn. *Symphony No. 94*, Third Movement, Measures 1-60.
4. Prokofieff. *Symphony No. 1*, Third Movement, Measures 1-41.
5. Diamond. *Rounds for String Orchestra*, Measures 348-399.
6. Gliere. "Russian Sailors Dance" from the *Red Poppy*, Measures 26-97.
7. Prokofieff. *Symphony No. 1*, Second Movement, Measures 5-64.
8. Tschaikovsky. *Symphony No. 6*, Second Movement, Measures 1-64.
9. Schubert. *Symphony No. 2*, Second Movement, Measures 1-25.
10. Bach. *Brandenburg Concerto No. 2*, First Movement, Measures 1-90.
11. Elgar. *Variations on an Original Theme for Orchestra* (Enigma), Measures 1-40.
12. Mozart. *Symphony No. 13*, Fourth Movement, Measures 1-123.
13. Brahms. *Symphony No. 2*, Third Movement, Measures 1-165.
14. Kodaly. *Peacock Variations*, Measures 18-54.

The second pilot test was administered to a total of 63 college music and nonmusic majors representing all undergraduate class levels. No instructions other than those printed in the answer booklet or recorded on the tape of the test of recognition and affective response were given to the subjects.

The first group tested in the second pilot study was a class of 27 students. Immediately after they had taken the test, the students were queried about their reactions and suggestions. Table 1 shows their responses to the specific questions asked. After these specific questions had been asked, a discussion of the answers to these questions, and the test in general, was held. The students who said that they had not understood the instructions for the questionnaire indicated that the main problem was in knowing whether or not to circle more than one alternative for each question. Because of this, a specific direction limiting the number of alternatives to be marked was added to each question. The students who had had difficulty recalling their experiences during Junior and Senior High School said that they thought they were able to make reasonably accurate estimates, even though such recall was difficult. The difficulty in computing the total composite time seemed to be a difficulty of recall rather than misunderstanding of the directions for the computation. Several of the students indicated that the question concerning the different combinations of musical performance activities needed an alternative that included the various combinations listed plus private lessons. The questionnaire was revised so that such indications could be made.

The students who answered that they did not understand the directions for the recognition part of the test indicated that the difficulty was in understanding the mechanics of marking their answers. They said that the first item of the test gave them sufficient practice and provided them with the understanding needed to complete

TABLE 1

RESPONSES OF THE FIRST GROUP TESTED TO QUERIES
ABOUT THE SECOND PILOT TEST

Question	Response		
	Yes	No	Unsure
1. Did you understand the directions on pages 1 and 2?	20	5	2
2. Did you have any difficulty recalling your experiences during Junior and Senior High School?	3	24	0
3. Did you have any difficulty computing the composite time totals requested?	4	23	0
4. Did you find any questions in which none of the categories provided adequately described your experience?	6	19	2
5. Did you understand the directions for Part 2?	15	6	6
6. Were the projected numbers distracting to you?	20	4	3
7. Did the musical example, "Twinkle, Twinkle, Little Star," help you to understand the directions to Part 2?	22	4	1
8. Did the motions or writing of your neighbors affect your answers?	6	19	2
9. Was there too much time between items?	2	25	0
10. Was there too little time between items?	3	23	1
11. Was the entire test too long?	16	10	1

the test. It seemed to be the consensus of opinion that the instructions for the recognition test should contain some sort of illustration of the interjection of other musical material between the first theme and its repetition which occurs in many of the test items. Because of this opinion, the recorded instructions were changed. The first theme of "Twinkle, Twinkle, Little Star" was demonstrated in exact and altered repetition. Then the entire tune was played (in its ABA form) to demonstrate the interjection of other musical material between the first theme and its repetition. This revised set of instructions was used in the remainder of the testing for the second pilot study.

Although the majority of the students stated that they found the projected numerals distracting, most of them believed that the distraction had not materially altered their test scores. A number of students believed that the movements of their neighbors, in writing down numbers on the answer booklets, influenced the way they responded to the test. Because of these distractions, an additional suggestion was recorded at the end of the instructions; it was recommended that the subjects might perform better if they listened with their eyes closed and looked at the numbers only when they recognized an exact or altered repetition of the first theme. Most of the subjects seemed to think that the ten second interval between items was sufficient for them to mark their like-dislike rating for that music.

Sixteen of the students indicated that the entire test was too long. When asked to estimate an ideal length, they suggested from four to twelve items. Most of the students, however, believed that

that they answered the final items as well as they did earlier ones, even though they had become somewhat tired of listening. Examination of their test papers showed this belief to be true. It was decided to retain the lengthy version of the test in hope that the longer test would yield a more adequate coefficient of reliability.

After this first administration of the second pilot test, and the subsequent revision of the test instructions, the test was administered to a group of 35 other students. This group included both music and nonmusic majors. The total recognition scores and individual item scores achieved by the 63 subjects in the second pilot study were punched on cards for computer processing. Analysis showed that the scores on the total test of recognition closely approximated the normal distribution. The curve had a skewness of -0.06 and a kurtosis of -2.93, while a normal curve has a skewness of zero and a kurtosis of -3.00. The range of the total test scores extended from -59 to +78, or 137 points. The Kelly range (the range of the remaining scores after the highest 10 percent and the lowest 10 percent have been eliminated), however, extended from -5 to +46, or 51 points. The mean of the distribution was 19.44 and the standard deviation was 22.67.

Scores made on the individual items of the test were analyzed to estimate item difficulty and the contribution of each item to the total test score. Wood[8] recommends that the average item difficulty should be about 50 percent. That is, about 50 percent of the subjects should answer the item correctly and the other 50 percent should answer it incorrectly. The items of the recognition test, however, did not present a simple dichotomy of "right" or "wrong," for it was possible to gain or lose varying numbers of points on each item. Thus, the standard item difficulty calculations were not appropriate. Because of this inappropriateness of standard procedures, percentages of the subjects were calculated for each of three categories for each item: those who gained one or more points; those who lost one or more points; and those who neither gained nor lost. The results of these calculations, and descriptions of the mean, standard deviation, and range of scores on each item are shown in Table 2.

Table 2 shows that on 7 of the 14 items, 50 percent or more of the subjects gained one or more points, while on those same items, from 6 to 41 percent of the subjects lost one or more points. On seven other items, fewer than 50 percent of the subjects gained any points. There were three items on which more subjects lost than gained points. On each item there were some subjects who neither gained nor lost points.

The range of scores on items number 7 and 10 were particularly large. These items were the longest in duration of the 14 test items, and their length had drawn some unfavorable comment from the subjects during the discussion of the test. Because of these extreme ranges and the comments by the subjects, these items were shortened when the test was revised.

A split-half reliability coefficient was computed for the odd versus the even items on the recognition test. The reliability, corrected by the Kuder-Richardson formula, was .69. A higher reliability than this was desired, so the discriminating power of each individual

TABLE 2

INDIVIDUAL ITEM INFORMATION: SECOND PILOT STUDY

Item	Percentage Gaining Points	Percentage Neither Gaining Nor Losing Points	Percentage Losing Points	Mean	S.D.	Range Low	Range High
1. Kodaly	47.62	20.64	33.34	0.27	2.94	-9	+6
2. Mozart No. 12	55.52	4.76	41.21	0.60	4.43	-9	+9
3. Hindemith	23.79	15.87	61.87	-1.55	2.72	-10	+3
4. Haydn	47.59	11.11	39.65	-0.03	3.95	-14	+6
5. Prokofieff (3rd)	50.79	19.05	31.73	0.57	1.85	-5	+4
6. Diamond	81.46	11.11	9.51	2.65	2.34	-3	+7
7. Gliere	77.72	9.52	14.25	6.17	5.71	-17	+16
8. Prokofieff (2nd)	71.40	15.85	14.27	2.00	2.73	-8	+6
9. Tschaikovsky	82.52	6.35	12.18	2.30	2.43	-4	+8
10. Schubert	92.03	4.76	6.32	6.62	5.36	-9	+16
11. Bach	44.41	22.22	34.89	0.34	2.76	-9	+6
12. Elgar	41.25	14.28	46.02	-0.21	2.59	-6	+5
13. Mozart No. 13	36.50	15.87	49.17	-0.31	3.41	-10	+6
14. Brahms	44.43	28.58	28.54	0.15	2.24	-6	+6

item was estimated by calculating the correlation of the item score with the score on the total test.[9] It was decided that any item which correlated less than +.40 with the test as a whole would be eliminated. The correlation of the individual items with the total test score is shown in Table 3.

TABLE 3

FOURTEEN-ITEM TEST: CORRELATION OF ITEM SCORES WITH TOTAL TEST SCORE

Item	Correlation with Total Test Score	Item	Correlation with Total Test Score
Kodaly	+.47	Prokofieff (2nd)	+.55
Mozart No. 12	+.55	Tschaikovsky	+.48
Hindemith	+.34	Schubert	+.61
Haydn	+.68	Bach	+.37
Prokofieff (3rd)	+.42	Elgar	+.52
Diamond	+.42	Mozart No. 13	+.48
Gliere	+.43	Brahms	+.32

On the basis of the item evaluation the musical selections by Bach, Hindemith, and Brahms were eliminated from the test. Total scores on the remaining eleven items were recomputed. The total scores on this eleven-item test ranged from -55 to +69, and had a Kelly range of from 0 to 44. The mean score was 20.71 and the standard deviation was 20.11. The curve of the distribution of total scores approximated normality; its skewness was -.084 and its kurtosis was -2.92. The split-half reliability coefficient, corrected for length by the Kuder-Richardson formula, was .81. The correlations of the individual item scores with the total test score are shown in Table 4. Each item of the eleven-item test, with the exception of the selection by Diamond, correlated with the total test score with a coefficient of at least +.40.

TABLE 4

ELEVEN-ITEM TEST: CORRELATION OF ITEM SCORES WITH TOTAL TEST SCORE

Item	Correlation with Total Test Score	Item	Correlation with Total Test Score
Kodaly	+.50	Prokofieff (2nd)	+.59
Mozart No. 12	+.53	Tschaikovsky	+.47
Haydn	+.69	Schubert	+.61
Prokofieff (3rd)	+.43	Elgar	+.53
Diamond	+.38	Mozart No. 13	+.48
Gliere	+.48		

Statistics describing the distributions of scores on the fourteen-item test and the eleven-item test are shown in Table 5. The data in Table 5 indicate that the removal of the items by Hindemith, Bach, and Brahms from the fourteen-item test resulted in an increase in test reliability. This increase, however, was accompanied by a reduction in the variability of the test scores. The standard

TABLE 5

FOURTEEN- AND ELEVEN-ITEM TESTS: DISTRIBUTION OF TOTAL SCORES

Parameter	Fourteen-Item Test	Eleven-Item Test
Mean	19.44	20.71
Standard Deviation	22.67	20.11
Split-Half Reliability	.69	.81
Range	-59 to +78	-55 to +69
Kelly Range	-5 to +46	0 to +44

deviation was reduced by 2.56 points, and the range by 13 points. Such a decrease in variability may be accompanied by a decline in the discriminative power of the test.

Ebel[10] has warned of the dangers inherent in using a sample to re-establish reliability scores after using that same sample for item analysis. In order to overcome these dangers, and to attempt to increase the discriminative power of the test, a revised version was prepared for use in the third pilot study.

Third Pilot Study

The revised test booklet used in the third pilot study was the same form as was used to gather data for the study proper. It is shown in Appendix A. Three new items were inserted into the eleven-item test developed in the second pilot study. These items were exerpts from compositions by Walton, Dallo Joio, and Haydn. An example item was placed at the beginning of the test proper, because the previous pilot testing had shown that the first item, no matter what it was, seemed to serve as a practice item and contributed little to the total score achieved on the test. Including the sample item, there were fifteen items on the test. The administration of the tape-recorded section of the test, which included the instructions and the 15 items, took about 33 minutes. The test items were arranged in the following sequence.

1. Brahms. *Variations on a Theme by Haydn*, Measures 1-29.
2. Mozart. *Symphony No. 12*, First Movement, Measures 1-157.
3. Dello Joio. *Variations, Chaconne, and Finale*, Measures 1-40.
4. Haydn. *Symphony No. 94*, Third Movement, Measures 1-60.
5. Prokofieff. *Symphony No. 1*, Third Movement, Measures 1-41.
6. Diamond. *Rounds for String Orchestra*, Measures 348-399.
7. Prokofieff. *Symphony No. 1*, Second Movement, Measures 5-64.
8. Gliere. "Russian Sailors Dance" from the *Red Poppy*, Measures 26-97.
9. Tchaikovsky. *Symphony No. 6*, Second Movement, Measures 1-32.
10. Schubert. *Symphony No. 2*, Second Movement, Measures 1-25.
11. Walton. *Variations on a Theme by Hindemith*, Measures 1-32.
12. Haydn. *Symphony No. 96*, Fourth Movement, Measures 1-48.
13. Elgar. *Variations on an Original Theme for Orchestra* (Enigma), Measures 1-40.
14. Mozart. *Symphony No. 13*, Fourth Movement, Measures 1-123.
15. Kodaly. *Peacock Variations*, Measures 18-54.

The test was given to a group of 285 college students all undergraduate levels and both music and nonmusic majors were represented in this group. The mean total recognition score achieved by these students was 43.97 and the standard deviation was 21.04. The split-half reliability, corrected by the Kuder-Richardson Formula, was .79. The correlation coefficient of each item score with the total test score is shown in Table 6.

TABLE 6

THIRD PILOT TEST: CORRELATION OF ITEM SCORES WITH TOTAL TEST SCORE

Item	Correlation with Total Test Score	Item	Correlation with Total Test Score
Mozart No. 12	+.51	Tschaikovsky	+.57
Dello Joio	+.45	Schubert	+.64
Haydn No. 94	+.55	Walton	+.53
Prokofieff (3rd)	+.34	Haydn No. 96	+.49
Diamond	+.56	Elgar	+.67
Prokofieff (2nd)	+.65	Mozart No. 13	+.28
Gliere	+.52	Kodaly	+.66

Because one of the purposes of this study was to investigate the relationship between the recognition test scores and like or dislike for the music in which the recognitions were made, it seemed to be a logical necessity to require the subjects to make their affective response judgments about the same hearing of the music as that in which they performed the recognition task.

To use a test of internal consistency to examine the reliability of the like-dislike judgments would be meaningless, for there is no reason to expect the persons taking the test to like all of the items equally well. Eighteen students who had served in the third pilot study took the test on a second occasion. The like-dislike ratings of these students on the test and re-test are shown in Appendix D. Examination of these scores shows that in about 38 percent of the cases, like-dislike judgments were the same for both tests; in about 45 percent of the cases the judgments changed only one scale degree in either direction; and in about 17 percent of the cases the judgments changed two or more scale degrees. Comparison of the mean like-dislike ratings made by each subject on the test and re-test reveals that in only one case did the average rating change by as much as one degree. In 13 of the 18 cases, the change in mean like-dislike ratings was less than one-half of a scale degree. This evidence, although based on an extremely small sample of the population tested, seems to indicate that the like-dislike judgments made on the test of affective response are reliable.

In the original plan for the study, it had been proposed to choose stimulus items that would be unfamiliar to the subjects who took the test. In the first and second pilot studies, it was found that most of the items were not familiar to most of the subjects. However, a few of the subjects claimed familiarity with some of the music. Because of this, it was decided to ask for indications of familiarity with each item so that an estimate could be made of the degree of familiarity of the subjects with the music of the test as a whole.

Of the 285 students who participated in the third pilot study, 194 were nonmusic majors and 91 were music majors. Table 7 shows the number of items with which these subjects indicated familiarity. Inspection of Table 7 reveals that almost 90 percent of the nonmusic majors indicated familiarity with only one or none of the items; about 98 percent of these students indicated familiarity with five or fewer items; and only one percent indicated familiarity with half or more of the items. These data seem to indicate that the great majority of the nonmusic majors tested were not familiar with the music of the test as a whole. Of the music majors, 53 percent indicated that they were familiar with only one or none of the items; about 72 percent indicated familiarity with five or fewer items; and about six percent indicated that they were familiar with half or more of the items.

In order to estimate whether familiarity had any statistically significant effect on the recognition test scores, a Mann Whitney U test was used to compare the scores achieved by the group of music majors who were familiar with more than half of the items on the test with the scores achieved by the group of music majors who had indicated familiarity with only one of the items. The group that had indicated familiarity with one item was chosen in preference to the group that had indicated familiarity with no items for this analysis. This choice was made because it was believed that the "no familiarity"

TABLE

FAMILIARITY WITH ITEM MUSIC: THIRD PILOT TEST

Number of Items	Nonmusic Majors Indicating Familiarity	Percentage	Music Majors Indicating Familiarity	Percentage
0	155	79	15	17
1	21	10	30	35
2	5	3	12	14
3	3	2	10	10
4	4	3	6	6
5	3	2	3	3
6	1	½	8	8
7	1	½	2	2
8	0	0	3	3
9	0	0	1	1
10	1	½	1	1

response might have been caused by misunderstanding of the test instructions. The indication of familiarity with at least one item seemed to indicate some understanding of the instructions for making such judgments. The Mann Whitney *U* data are shown in Appendix E. The size of the groups compared made it necessary to refer the results of the computation to the Table of *z*.[11] The derived *z*, after correction for ties in ranks in the *U* test, was .482. The probability of obtaining a *z* this large by chance is .32. Thus, there seemed to be no significant difference between the scores achieved on the test of recognition by those music majors who indicated they were familiar with the music of at least half of the items of the test and those music majors who indicated they were familiar with only one of the fourteen test items.

The versions of the test of recognition, the test of affective response, and the questionnaire which were verified in the third pilot study were used to gather data for the study proper.

Subjects

Usable test results were obtained from 1,572 college and university students in four midwestern states, and 343 high school students from one of these states. Of the college and university students, 1,194 were nonmusic majors and 378 were music majors. The majority of these subjects were tested in groups; for the most part, testing was done in academic classes. Data for music majors were gathered from classes in music theory, music history and literature, music education, and from music ensembles. Nonmusic majors were tested in classes in music appreciation, elementary education, secondary education, psychology, and in music ensembles. Music and nonmusic majors were tested at Indiana University, Interlochen Arts Academy (sponsored by the University of Michigan), Kalamazoo College, the University of Kansas, and Michigan State University. Nonmusic majors were also tested at the University of Ohio and Ohio State University. Testing of high school students was done at Michigan State University, where the students were attending a summer music camp program. These students seemed to comprise a typical cross-section of Michigan high school students, representing both urban and rural communities; few of them indicated that they planned to study music as a college major.

Treatment of Data

The data gathered at the various schools sampled were combined for analysis. The answer booklets were scored and prepared for key-punching. Each item of the recognition test was scored separately. Two points were assigned for each correct identification of a repetition or alteration of the first theme within each test item. One point was assigned for a repetition identified as an alteration, or an alteration identified as a repetition. One point was deducted for each identification of a repetition or alteration when neither occurred at that point in the test item. Each item of the affective response test was scored separately. An IBM punch card was prepared for each subject tested. On this card were recorded the individual item recognition test scores, the individual item affective response scores, the data from the questionnaire section of the answer booklet, and the cumulative grade point average.

All calculations were performed by the Control Data 3600 computer located at Michigan State University. The computer calculated total recognition and total affect scores from the individual item scores for each subject tested. These total scores were used for most of the analysis of variance and correlation problems involved in the analysis of the data. Statistical programs prepared by the Agricultural

Experiment Station at Michigan State University were adapted to calculate the basic statistics, the product-moment correlations, and the analysis of variance problems.

Information gained from the questionnaire was used to cast the recognition scores achieved by the subjects into various groups for the purpose of analysis. Comparisons were made of the recognition scores achieved by groups of music and nonmusic majors who had had different kinds and amounts of musical experience and who indicated different musical preferences. Correlation coefficients were computed between recognition scores and grade point averages; between recognition scores and total affective response scores; between the recognition score on each item and the like-dislike score for that item; and between the number of years of academic study of music in college and the recognition test score. The data gained from the high school sample were analyzed separately from the college and university sample. The results of these analyses are presented in Chapter IV.

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CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

The analysis of the data was organized in sections that seemed appropriate for the research questions asked in this study. The sections are considered in the following order: (1) statistical description of the tests, (2) the association of recognition scores and musical experience, (3) the association of recognition scores and musical preference, (4) the association of recognition scores and affective response, and (5) the association of recognition scores and academic aptitude.

Statistical Description of the Tests

The Test of Recognition

The mean recognition score for the entire sample of 1,914 students was 43.50. The standard deviation for the total group was 20.48. Thus it can be assumed that about 99.73 percent of the sample scored between -17.94 and 104.94, or plus and minus three standard deviations from the mean. There were 124 points possible on the test of recognition if every exact and altered repetition were correctly identified and no points were deducted for errors. There was no lower limit for possible scores because points were deducted for errors.

Because of the nature of the test of recognition, the meaning of the absolute values of the mean scores in relation to the total number of possible points is difficult to assess. In order to prepare a key for the test, it was necessary to set an arbitrary limit to the amount of time permitted for the subjects to recognize whether a particular segment of music was or was not a repetition of the first theme. An arbitrary cut-off point, beyond which an indicated recognition was considered to be in error, was chosen in the series of numerals projected for each repetition. Some students might have taken more than the allotted amount of time to make their decisions, and then put down on the answer sheets the number which was being projected when they finally did reach their decisions. Thus, they could have made a correct recognition, but answered the test so as to have points deducted from, rather than added to, their total scores. It seems reasonable to assume that such errors were randomly distributed throughout the scores achieved by the students tested; thus, the validity of the comparisons of scores achieved by different groups of subjects should not be influenced by errors of this sort.

Statistics describing the recognition scores achieved by college music and nonmusic majors and by high school students are presented in Table 8. These statistics include the number of students, the mean score, and the standard deviation for each group. Observation of the mean scores listed in Table 8 reveals that the music majors as a group scored 15.45 points higher than the nonmusic majors, and 13.04 points higher than the high school students. The differences between the standard deviations of the scores achieved by the three total groups indicates that there was much more unanimity of judgment among music majors than among the other students tested. The

TABLE 8

RECOGNITION SCORES ACHIEVED BY MUSIC MAJORS, NONMUSIC MAJORS, AND HIGH SCHOOL STUDENTS

Class	Music Majors			Nonmusic Majors			High School Students		
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Fr.	103	53.47	11.84	387	40.43	19.19	61	42.85	19.89
So.	65	55.95	10.81	257	42.04	21.52	68	40.53	18.80
Jr.	54	56.88	12.51	307	38.73	23.13	113	42.47	19.04
Sr.	68	54.21	13.65	227	38.30	21.37	110	43.86	20.96
Grad.	88	57.50	15.96	16	46.13	17.77	0		
Total	378	55.46	13.20	1194	40.01	21.19	342	42.42	19.67

differences between the mean scores achieved by the three groups seem appreciable. A series of t tests were calculated to investigate the possibility that these differences occurred by chance. The results of these t comparisons are shown in Table 9. The difference between the mean scores achieved by music majors and nonmusic majors proved to be statistically significant beyond the .01 level, as did the difference between the mean scores achieved by music majors and high school students. The difference between the mean scores achieved by nonmusic majors and high school students, however, was not statistically significant.

The differences between the mean scores achieved by students in the various classes within each of the three groups described in Table 8 seem to be rather small. Three analysis of variance problems

TABLE 9

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE MEAN
RECOGNITION SCORES ACHIEVED BY MUSIC
MAJORS, NONMUSIC MAJORS, AND
HIGH SCHOOL STUDENTS

Categories Compared	Mean	t	df	Probability
Music Nonmusic	55.46 40.01	13.376	1570	<.01*
Music High School	55.46 42.42	10.541	718	<.01*
Nonmusic High School	40.01 42.42	1.881	1534	>.05

*Statistically Significant

were computed to estimate the statistical significance of the differences between the mean recognition scores achieved by students at the various class levels within each group. The results of these analyses are shown in Table 10. The analyses of variance revealed that none of the differences between means within each group reached statistical significance at the .05 level. Thus, within each group (music majors, nonmusic majors, and high school students) there is no difference between the mean recognition scores achieved by students at the various class levels. The differences that appear in Table 8 were probably caused by sampling error rather than by real differences between the scores achieved by students at the various class levels. Even if the differences were real, they would be so small as to be of little practical significance.

TABLE 10

ANALYSIS OF VARIANCE OF RECOGNITION SCORES ACHIEVED BY MUSIC MAJORS, NONMUSIC MAJORS, AND HIGH SCHOOL STUDENTS: CATEGORY VARIABLE--CLASS IN SCHOOL

Group	Source of Variance	Sum of Squares	df	Mean Square	F	Significance
Music	Between	1004.821	4	251.205	1.448	0.22
	Within	64699.002	373	173.455		
	Total	65703.823	377			
Nonmusic	Between	2884.062	4	721.016	1.608	0.17
	Within	532991.817	1189	448.269		
	Total	535875.879	1193			
High School	Between	464.094	3	154.698	0.397	0.76
	Within	131937.492	339	389.196		
	Total	132401.586	342			

The Test of Affective Response

The total affect scores must be interpreted in light of the fact that interval measurement of affect was not achieved. Therefore, the combination of individual affect scores into total scores, and the statistical manipulations of the various parameters of the affect score distributions are not entirely valid in the best statistical sense. However, for the exploratory purposes of this study, the total affect scores can be used to estimate in general the degree of like or dislike evidenced by the subjects for the music of the test as a whole. The highest possible affect score, for a person who indicated extreme liking for every musical item of the test, is 98. The lowest possible score, for a person who indicated extreme dislike for every musical item of the test, is 14. The median, or point of affective neutrality or balance, is 56.

The mean affect score for the entire sample of 1,914 students was 75.51 and the standard deviation was 12.03. There were some variations in the total affect scores achieved by college music and nonmusic majors and by high school students. The mean total affect score for music majors was 82.25; for nonmusic majors the mean was 74.29; and for high school students the mean was 71.83. A series of t calculations was used to estimate the statistical significance of the differences between these means. The results of these calculations are shown in Table 11. Each comparison revealed a statistically significant

TABLE 11

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE MEAN AFFECT SCORES ACHIEVED BY MUSIC MAJORS, NONMUSIC MAJORS, AND HIGH SCHOOL STUDENTS

Categories Compared	Mean	t	df	Probability
Music Nonmusic	82.25 74.29	11.67	1570	<.01*
Music High School	82.25 71.83	12.93	718	<.01*
Nonmusic High School	74.29 71.83	3.53	1534	<.01*

*Statistically Significant

difference. In general, the music majors expressed a higher degree of liking for the music of the test than did nonmusic majors, who, in turn, expressed a higher degree of liking for the music than did the high school students. The mean affect scores for all three groups were well on the positive side of neutrality. From these data it seems evident that most of the students who participated in this study expressed some degree of liking for the music of the test.

The Association of Recognition Scores and Musical Experience

Performance Experience

In order to examine the association of recognition scores and participation in different kinds and amounts of performance activities provided in the public school music curriculum, the scores were categorized in several ways. Each set of scores (music majors, nonmusic majors, and high school students) was further categorized according to the subjects' participation in different kinds of performance activities. These activities were band; orchestra; and chorus; and combinations of band and orchestra; band and chorus; orchestra and chorus; and band, orchestra, and chorus. Glee clubs were included in the chorus category. A category was provided for those students who had had experience in piano lessons only, and another category was provided for those students who had had no performance experience at all. Table 12 shows the number of students in each category and the mean scores achieved by those students on the test of recognition.

TABLE 12

MEAN RECOGNITION SCORES GROUPED ACCORDING TO SUBJECTS' PARTICIPATION IN DIFFERENT KINDS OF PERFORMANCE ACTIVITIES

Kind or Combination of Activity	Music Majors		Nonmusic Majors		High School Students	
	N	Mean	N	Mean	N	Mean
Band	19	54.21	101	36.42	109	39.35
Orchestra	10	55.70	15	38.06	19	40.63
Chorus	83	56.45	479	41.11	59	42.17
Band and Orchestra	38	51.65	28	40.96	57	42.95
Band and Chorus	82	56.86	139	44.72	46	45.15
Orchestra and Chorus	44	55.15	46	44.76	9	48.00
Band, Orchestra, and Chorus	96	55.41	63	49.71	43	46.53
Piano only	4	56.00	78	35.82	0	
None	2	46.50	245	34.62	0	

Inspection of Table 12 shows that the differences previously observed between recognition scores achieved by music majors, nonmusic majors, and high school students seem to be reasonably consistent in the various kind of performance activity categories. There are different amounts of variation within each of the three major groups. Three analysis of variance problems, the results of which are shown in Table 13, revealed that the differences between the mean scores in the various kind of activity categories were statistically significant only among the nonmusic majors. The differences within the music major group could have occurred by chance with a probability of about 0.69, and the differences within the high school group could have happened by chance with a probability of about 0.39.

TABLE 13

ANALYSIS OF VARIANCE OF RECOGNITION SCORES: CATEGORY VARIABLE--KIND OF PERFORMANCE ACTIVITY

Group	Source of Variance	Sum of Squares	df	Mean Square	F	Probability
Music	Between	990.166	8	123.771	0.706	0.69
	Within	64713.657	369	175.376		
	Total	65703.823	377			
Nonmusic	Between	20496.087	8	2562.011	5.891	0.005*
	Within	515379.792	1185	434.920		
	Total	535875.879	1193			
High School	Between	2460.255	6	410.042	1.061	0.39
	Within	129518.953	335	386.624		
	Total	131979.208	341			

*Statistically Significant

The differences between the recognition scores in the various categories within the nonmusic major group had a probability level of about 0.005. Thus, it is apparent that there are real differences between the mean scores achieved by nonmusic majors who had had experience in different kinds or combinations of performance activities. The kind of experience categories are ranked in order of descending mean sçores in Table 14.

TABLE 14

MEAN RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS:
KIND OF PERFORMANCE ACTIVITY CATEGORIES
ORDERED BY RANK

Category	Mean
Band, Orchestra and Chorus	49.71
Orchestra and Chorus	44.76
Band and Chorus	44.72
Chorus	41.11
Band and Orchestra	40.96
Orchestra	38.06
Band	36.42
Piano only	35.82
None	34.62

In order to find which of the differences between the means described in Table 14 were statistically significant, _t_ tests were used to compare the mean score in each category with the mean score in every other category. The results of those comparisons which revealed statistical significance are presented in Table 15. There were no statistically significant differences between the mean recognition scores achieved by nonmusic majors who had participated in no musical performance activities, piano only, band, orchestra, or combinations of band and orchestra. Inspection of Table 15 shows that students who had participated in chorus achieved a mean

TABLE 15

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE MEAN RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS GROUPED BY KIND OF PERFORMANCE ACTIVITY CATEGORIES

Categories Compared	Mean	t	df	Probability
Band	36.42			
Chorus	41.11	2.034	578	<.05*
Band	36.42			
Band & Chorus	44.72	3.005	238	<.05*
Band	36.42			
Orchestra & Chorus	44.76	2.190	145	<.05*
Band	36.42			
Band, Orchestra, & Chorus	49.71	4.179	162	<.01*
Orchestra	38.06			
Band, Orchestra, & Chorus	49.71	2.397	76	<.05*
Chorus	41.11			
Band, Orchestra, & Chorus	49.71	3.177	540	<.01*
Chorus	41.11			
Piano only	35.82	2.069	555	<.05*
Chorus	41.11			
None	34.62	3.926	722	<.01*
Band & Orchestra	40.96			
Band, Orchestra, & Chorus	49.71	2.189	89	<.05*
Band & Chorus	44.72			
Piano only	35.82	2.947	215	<.01*
Band & Chorus	44.72			
None	34.62	4.514	382	<.01*

TABLE 15 (continued)

Orchestra & Chorus	44.76			
Piano only	35.82	2.319	122	<.05*
Orchestra & Chorus	44.76			
None	34.62	3.043	289	<.01*
Band, Orchestra, & Chorus	49.71			
Piano only	35.82	4.343	139	<.01*
Band, Orchestra, & Chorus	49.71			
None	34.62	5.362	306	<.01*

*Statistically Significant

recognition score that was significantly higher than that achieved by students who had participated in no performance activity, in piano only, or in band. The differences between the mean scores of the students who had participated in combinations of band, orchestra, and chorus; band and chorus; or orchestra and chorus were not great enough to achieve statistical significance. However, the mean score of the band, orchestra, and chorus category was significantly higher than that of the chorus category and each category which contained a lower mean score than that of the chorus. It seems from these data that the nonmusic majors who had participated in chorus, or in chorus in combination with band and/or orchestra scored significantly higher than those who had participated in band alone, piano alone, or no performance activity.

Amount of Experience in Performance Activities

In order to investigate the association between amount of experience in performance activities and scores achieved on the test of recognition, the subjects were categorized according to composite total years of participation in the various kind of activity categories that were described in the previous section, plus participation in other private lessons. The subjects were asked to indicate their total performance experience since and including the seventh grade, counting one year for each year of participation in each activity. Thus, a student who had been in band, orchestra, and chorus each year during grades seven through twelve would have accumulated a composite total of 18 years of experience in performance activity. Table 16 describes the recognition scores achieved by music majors, nonmusic majors, and high school students categorized according to total composite amounts of experience in musical performance activities.

Inspection of the data in Table 16 reveals that, in general, the mean recognition scores increase as the amount of performance experience increases. This relationship seems evident among each of the three groups -- music majors, nonmusic majors, and high school students. It does not seem to hold, however, in the categories representing the higher composite amounts of performance experience.

Analysis of variance was computed to ascertain statistical significance of the apparent differences within each of the three groups. The results of these analyses are presented in Table 17. The analyses of variance revealed that the differences between the

TABLE 16

MEAN RECOGNITION SCORES GROUPED ACCORDING TO DIFFERENT COMPOSITE AMOUNTS OF EXPERIENCE IN PERFORMANCE ACTIVITIES

Amount of Experience Category	Music Majors		Nonmusic Majors		High School Students	
	N	Mean	N	Mean	N	Mean
None	2	46.50	245	34.62	0	
1-2 Years	8	47.50	201	36.45	16	34.25
3-4 Years	6	51.16	181	39.19	59	36.96
5-6 Years	27	52.37	184	40.40	89	42.56
7-10 Years	85	56.27	207	42.26	110	44.46
11-15 Years	107	57.00	102	47.36	48	48.31
16-20 Years	71	55.11	48	52.56	13	39.92
21+ Years	72	55.19	26	51.19	8	40.87

mean scores achieved by music majors in the various amount of performance experience categories could have occurred by chance about 35 times out of 100. Thus there is substantial doubt that the apparent differences represent real variations in recognition scores achieved by music majors rather than sampling errors. The differences among the high school students, and those among the nonmusic majors, however, did prove to be statistically significant. The differences among the high school students could not have occurred by chance more than four times in 100, and those among the nonmusic majors could not have occurred by chance more than five times in 1,000.

TABLE 17

ANALYSIS OF VARIANCE OF RECOGNITION SCORES: CATEGORY VARIABLE--AMOUNT OF PERFORMANCE EXPERIENCE

Group	Source of Variance	Sum of Squares	df	Mean Square	F	Probability
Music	Between	1359.040	7	194.148	1.116	0.35
	Within	64344.782	370	173.905		
	Total	65703.823	377			
Nonmusic	Between	27180.338	7	3882.905	9.053	0.005*
	Within	508695.541	1186	428.917		
	Total	535875.879	1193			
High School	Between	5082.635	6	847.106	2.236	0.04*
	Within	127318.952	336	378.925		
	Total	132401.586	342			

*Statistically Significant

A series of t tests was calculated to discover which of the differences between the mean scores of the various amount of experience categories were great enough to be statistically significant. The results of those calculations which showed significant differences among the nonmusic majors are presented in Table 18. In only one case was the mean score of an amount of experience category significantly different from the mean score of a category adjacent to it; this case occurred between the 7-10 and the 11-15 years of experience categories. At the upper end of the amount of experience scale (from 11 years up) there was no significant increase in mean scores achieved by groups of students who had increasing composite amounts of performance experience.

TABLE 18

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE MEAN RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS GROUPED BY AMOUNT OF PERFORMANCE EXPERIENCE

Categories Compared	Mean	t	df	Probability
None	34.62			
3-4 Years	39.19	2.886	424	<.01*
1-2 Years	36.45			
5-6 Years	40.40	2.475	383	<.05*
3-4 Years	39.19			
11-15 Years	47.36	3.106	281	<.01*
5-6 Years	40.40			
11-15 Years	47.36	2.773	284	<.01*
7-10 Years	42.26			
11-15 Years	47.36	2.050	307	<.05*

*Statistically Significant

In every case except one the comparison of the mean of one group with that of a group one category removed from it revealed a statistically significant difference. The exception to this occurred between the 3-4 and 7-10 years of experience categories; the difference between the mean scores of these categories was very close to achieving significance at the .05 level. These data confirm that the mean scores achieved by nonmusic majors on the test of recognition increased as the scores were grouped on the basis of increasing composite amounts of experience in performance activities.

The *t* test comparisons of the mean scores of the various amount of performance experience categories among the high school students showed that none of the adjacent categories contained mean scores which differed enough to reach statistical significance. The mean score of the 7-10 years of experience category was significantly higher than that of the 3-4 years of experience category at the .05 level. A significant difference at the same level was found when the 5-6 years and 11-15 years of experience categories were compared. The means of the 16-20 years of experience and the 21+ years of experience categories did not differ significantly from the mean of the 11-15 years of experience category. In other words, recognition scores tended to increase as total years of experience increased up to the level of the 11-15 years of experience category. Total amounts of performance experience greater than 11-15 years were not associated with increases in recognition scores.

The presence of scores in the 21+ years of experience category for high school students is questionable. To achieve this amount of experience during the typical six year period of secondary schooling, a student would have to participate in an average of 3.5 musical performance activities each year. It seems possible that the presence of subjects in the highest amount of experience category for high school students is due to miscoding of the subjects' responses, or to misunderstanding of the questionnaire instructions by the subjects.

It is apparent that for music majors, amount of performance experience is not significantly associated with recognition scores achieved, while for nonmusic majors and high school students these two factors are significantly associated. The structure of this data does not permit conclusions concerning cause and effect; there may be some other factor or factors operating to influence the differences that were found in recognition scores. It may be, for instance, that nonmusic majors and high school students who are better able to make the recognitions as measured elect to take part in more performance activities than do those who cannot make these recognitions as well. The fact that music majors do not evidence a similar increase in recognition score with increasing amounts of experience indicates that the primary causal factors underlying differences in recognition scores are probably something other than the simple accumulation of performance experience.

Interaction of Amount and Kind of Performance Experience

In order to examine the interaction of amount and kind of performance experience, the recognition scores achieved by each of the three groups -- music majors, nonmusic majors, and high school students -- were grouped into cells according to different composite amounts of experience in different kinds or combinations of performance activities. The number of subjects in each cell and the mean recognition score of each cell for music majors are shown in Table 19.

TABLE 19

MEAN RECOGNITION SCORES ACHIEVED BY MUSIC MAJORS CAST INTO CELLS ACCORDING TO KIND AND AMOUNT OF EXPERIENCE IN PERFORMANCE ACTIVITY

Activity	1-2 Years	3-4 Years	5-6 Years	7-10 Years	11-15 Years	16-20 Years	21+ Years	None
Band	N= 0	N= 0	N= 3 64.00	N= 10 50.00	N= 3 61.66	N= 2 53.00	N= 1 43.00	
Orchestra	N= 0	N= 1 54.00	N= 1 53.00	N= 2 45.50	N= 4 63.75	N= 1 37.00	N= 1 67.00	
Chorus	N= 4 49.75	N= 4 50.75	N= 11 51.54	N= 23 58.26	N= 22 59.00	N= 9 61.22	N= 10 52.80	
Band and Orchestra	N= 2 38.00	N= 0	N= 1 34.00	N= 4 54.25	N= 11 52.18	N= 10 54.10	N= 10 52.10	
Band and Chorus	N= 1 62.00	N= 1 50.00	N= 3 57.00	N= 20 55.30	N= 26 58.62	N= 18 56.94	N= 13 55.77	
Orchestra and Chorus	N= 0	N= 0	N= 6 46.50	N= 8 58.75	N= 16 52.87	N= 7 59.71	N= 7 59.14	
Chorus, Band, and Orchestra	N= 1 43.00	N= 0	N= 2 59.00	N= 17 59.47	N= 24 56.37	N= 23 51.13	N= 29 55.82	
Piano only	N= 0	N= 0	N= 0	N= 1 44.00	N= 1 64.00	N= 1 59.00	N= 1 57.00	
None								N= 2 46.50

Inspection of Table 19 reveals no consistent difference between the scores achieved by groups of music majors who had had equal composite amounts of experience in different kinds or combinations of performance activities. Several of the cells show mean scores which differ greatly from each other. Because of the small number of subjects within these cells, it is not likely that the scores of the individual subjects within the cells are normally distributed; thus the apparent differences in means may be sampling errors rather than real differences. A _t_ test was calculated between the extreme mean scores within each amount of experience category in which N equaled at least 10. None of these _t_ comparisons achieved significance at the .05 level. The foregoing analysis seems to indicate that equal amounts of experience in different kinds or combinations of performance activities have no significant association with the achievement of different scores on the test of recognition by college music majors.

The number of subjects in each cell and the mean recognition score of each cell for nonmusic majors are shown in Table 20. Few consistent differences are evident between the scores achieved by groups of nonmusic majors who had had equal composite amounts of experience in different combinations of performance activities. As was the case with the music majors, much of this lack of consistency may be attributed to the numerous cells that have small populations.

The number of subjects within the cells of the 7-10 years of experience category seemed most nearly to warrant a series of _t_ tests to examine the statistical significance of the differences between the mean scores of the various cells. The results of the _t_ tests which proved significant are shown in Table 21. Examination of this table shows that the mean score achieved by the students who had had from 7 to 10 years of experience in a combination of

TABLE 20

MEAN RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS CAST INTO CELLS ACCORDING TO KIND AND AMOUNT OF EXPERIENCE IN PERFORMANCE ACTIVITY

Activity	1-2 Years	3-4 Years	5-6 Years	7-10 Years	11-15 Years	16-20 Years	21+ Years	None
Band	N= 13 34.46	N= 13 33.88	N= 40 41.35	N= 23 31.74	N= 5 29.20	N= 2 45.00	N= 0	
Orchestra	N= 0	N= 4 39.75	N= 6 39.00	N= 3 17.00	N= 0	N= 2 62.50	N= 0	
Chorus	N=150 37.42	N=119 40.07	N= 87 40.27	N= 72 41.72	N= 33 54.64	N= 10 59.10	N= 8 51.13	
Band and Orchestra	N= 0	N= 1 61.00	N= 6 50.16	N= 14 43.93	N= 5 26.00	N= 1 63.00	N= 0	
Band and Chorus	N= 4 26.75	N= 10 42.10	N= 23 40.65	N= 54 44.68	N= 31 46.64	N= 11 52.45	N= 6 52.83	
Orchestra and Chorus	N= 2 11.00	N= 5 32.40	N= 5 37.80	N= 14 49.78	N= 14 47.71	N= 6 53.50	N= 0	
Chorus, Band, and Orchestra	N= 1 38.00	N= 2 24.50	N= 5 37.40	N= 17 51.82	N= 11 53.91	N= 16 47.25	N= 11 57.09	
Piano only	N= 31 35.45	N= 22 39.27	N= 12 35.83	N= 10 35.60	N= 3 15.00	N= 0	N= 0	
None								N=245 34.62

band, orchestra, and chorus was significantly higher than the mean scores achieved by students who had had 7 to 10 years of experience in piano only, band only, or chorus only. The difference between the mean recognition score achieved by those students who had accumulated experience in band only and the mean score achieved by those who had participated in chorus only approached significance in favor of the latter (computed t was 1.94, needed for significance at the .05 level was 1.98); and the mean score for the band cell was significantly lower than that for the band and chorus cell and that for the orchestra and chorus cell. It did not differ significantly from that for the band and orchestra cell.

TABLE 21

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE MEAN RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS IN THE KIND OF EXPERIENCE CELLS WITHIN THE 7-10 YEARS OF EXPERIENCE CATEGORY

Categories Compared	Mean	t	df	Probability
Band Band & Chorus	31.74 44.68	2.285	75	<.05*
Band Orchestra & Chorus	31.74 49.78	2.293	35	<.05*
Band Band, Orchestra, & Chorus	31.74 51.82	2.768	38	<.01*
Chorus Band, Orchestra, & Chorus	41.72 51.82	2.196	87	<.05*
Piano Band, Orchestra, & Chorus	35.60 51.82	2.230	25	<.05*

*Statistically Significant

It is perhaps notable that the scores achieved by students who had had performance experience only in piano, or in band, did not differ appreciably from the scores of those students who had had no performance experience at all. The meaning of these significant differences is not entirely clear, for the pattern is not consistent in the other amount of experience categories. It is possible, however, that if the other categories were adequately populated, this same pattern of differences would appear.

The results of the foregoing analyses seem to imply that the simple accumulation of experience in one school music performance activity may differ appreciably from the accumulation of an equal amount of experience in another such activity in its association with the achievement of different scores on the test of recognition by nonmusic majors in college. There is some indication that students who participated in combinations of activities including chorus achieved higher recognition scores than did students who had had an equal amount of experience in a single activity.

The number of subjects in each cell and the mean recognition score of each cell for high school students are shown in Table 22. Inspection of this table reveals no consistent pattern of differences between the mean scores achieved by groups of high school students who had had equal composite amounts of experience in different kinds or combinations of performance activities. The mean scores in a number of the cells differ appreciably from each other. Most of these cells contain very small populations. A series of t test comparisons revealed that there were no significant differences between the mean recognition scores of the kind of experience cells within any of the amount of experience categories.

TABLE 22

MEAN RECOGNITION SCORES ACHIEVED BY HIGH SCHOOL STUDENTS CAST INTO CELLS ACCORDING TO KIND AND AMOUNT OF EXPERIENCE IN PERFORMANCE ACTIVITY

Activity	1-2 Years	3-4 Years	5-6 Years	7-10 Years	11-15 Years	16-20 Years	21+ Years	None
Band	N= 6 35.00	N= 19 31.53	N= 35 38.46	N= 35 41.63	N= 9 52.77	N= 4 46.75	N= 1 15.00	
Orchestra	N= 2 57.00	N= 7 35.28	N= 6 38.50	N= 3 52.00	N= 1 24.00	N= 0	N= 0	
Chorus	N= 8 28.00	N= 14 45.43	N= 18 44.11	N= 15 45.80	N= 3 36.66	N= 1 37.00	N= 0	
Band and Orchestra	N= 0	N= 8 39.13	N= 13 46.07	N= 20 41.80	N= 14 45.78	N= 1 37.00	N= 1 22.00	
Band and Chorus	N= 0	N= 4 25.75	N= 10 47.00	N= 20 45.95	N= 8 50.00	N= 1 56.00	N= 3 43.00	
Orchestra and Chorus	N= 0	N= 1 65.00	N= 1 72.00	N= 4 45.00	N= 3 38.33	N= 0	N= 0	
Chorus, Band, and Orchestra	N= 0	N= 6 35.83	N= 6 46.00	N= 12 49.42	N= 10 55.40	N= 6 33.66	N= 3 53.66	
Piano only	N= 0	N= 0	N= 0	N= 1 63.00	N= 0	N= 0	N= 0	
None								N= 0

Listening Experience

In order to examine the association of recognition scores achieved and different amounts of listening experience in and outside of school, the scores were categorized in several ways. The separation of music majors, nonmusic majors, and high school students was maintained. On the questionnaire, the subjects were asked to estimate the amount of listening experience, both guided and unguided, they had had in junior high school, senior high school, and college. Because of the highly subjective nature of these estimates, and the likelihood that the terms "some" and "much" on the questionnaire were interpreted differently by different students, only three gross categories were used for the grouping of amount of listening experience. The numbers used to indicate the various amounts of listening on items 5, 6, and 7 of the questionnaire were summed. If a student scored a total of from 0 to 7 points on these items, he was included in the "little or none" category of listening experience. If he scored from 8 to 14 points, he was included in the "some" category, and if he scored from 15 to 21 points, he was included in the "much" category. The highest possible total was 21 points. Because of the method of combining scores to estimate a total amount of listening experience, none of the high school students were classified in the "much" category.

An analysis of variance was calculated to compare the listening experience categories within each of the three groups -- music majors, nonmusic majors, and high school students. The results of these three analysis of variance problems are shown in Table 23.

TABLE 23

ANALYSIS OF VARIANCE OF RECOGNITION SCORES: CATEGORY VARIABLE--AMOUNT OF LISTENING EXPERIENCE

Group	Source of Variance	Sum of Squares	df	Mean Square	F	Probability
Music	Between	2731.751	2	1365.875	8.134	.005*
	Within	62972.072	375	167.926		
	Total	65703.823	377			
Nonmusic	Between	7676.025	2	2558.675	5.765	.005*
	Within	528199.854	1190	443.865		
	Total	535875.879	1192			
High School	Between	125.548	1	125.548	0.324	.58
	Within	132276.038	341	387.906		
	Total	132401.586	342			

*Statistically Significant

The analysis of variance computations showed that there were significant differences between categories within the music majors and the nonmusic majors groups, but not within the high school student group. A series of t tests was used to discover which categories differed significantly from the others within the music major and nonmusic major groups. The results of these t tests are shown in Table 24. Among the nonmusic majors, persons who had had much listening experience achieved a significantly higher mean recognition score than did those who had had some listening experience, while the latter group achieved a significantly higher score than did those students who had had little or no listening experience. Among the music majors, those students who were in either the "some" or "much" category scored significantly higher than those who were in the "little or none" category. There was no statistically significant difference between the mean recognition scores achieved by the music majors who were in the "some" and the "much" categories.

TABLE 24

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE MEAN RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS AND MUSIC MAJORS GROUPED BY AMOUNT OF LISTENING EXPERIENCE

Categories Compared	Mean	t	df	Probability
Nonmusic Majors				
Little	37.16			
Some	40.66	1.98	1089	<.05*
Some	40.66			
Much	46.36	2.62	800	<.01*
Little	37.16			
Much	46.36	3.83	491	<.01*
Music Majors				
Little	48.88			
Some	56.66	3.92	305	<.01*
Some	56.66			
Much	56.17	0.24	322	>.05
Little	48.88			
Much	56.17	3.09	123	<.01*

*Statistically Significant

Among the high school students, only the "little or none" and the "some" categories were populated. Most of the high school students who were classified in the "some" category had not accumulated much more than the minimum level of listening experience required for this category. Thus, there was less variability in the amounts of listening experience among the high school students than among the college students tested. This small variability might account for the absence of a significant difference between the recognition scores in the "little or none" and the "some" categories for high school students.

Academic Experience in Music

The subjects were asked to indicate the number of academic years they had taken formal college courses in music theory, history, and literature. The number of high school students and nonmusic majors who had had any academic study in these courses was too small to support any valid correlational analysis.

Among the music majors, the mean number of total academic years of study in such courses was 4.96, and the standard deviation was 2.88 years. In order to examine the association of number of years of such academic study in music and scores achieved on the test of recognition, a product-moment coefficient of correlation was calculated between these variables. The correlation coefficient for music majors was +0.083. This coefficient is not high enough to be statistically significant at the .05 level. This indicates that there is no significant relationship between the number of years of academic study of college courses in music theory, history, and literature, and the scores achieved by college music majors on the test of recognition.

The Association of Recognition Scores and Musical Preference

Subjects were asked to indicate on seven-point scales their degree of like or dislike for five different categories of music. The five categories were: (1) classical music (used as an omnibus term to indicate what is sometimes called art music, serious music, or "legitimate" music); (2) jazz music; (3) rock and roll music; (4) folk music; and (5) currently popular music (an omnibus term to include show tunes and other music that does not fall into one of the other four categories). The seven positions on the like-dislike continuum were: like very much (7); like moderately (6); like some (5); neutral (4); dislike some (3); dislike moderately (2); and dislike very much (1). Table 25 shows the mean recognition scores achieved by the total group of 1,914 subjects categorized according to amount of like or dislike expressed for music of each of the five categories.

The data presented in Table 25 reveal several patterns. In each of the five musical categories, most of the subjects indicated some degree of liking for the music. Fewer subjects indicated dislike for classical music than for the music of any other category, and the most highly populated cell was that for those who indicated they like classical music very much.

The subjects who indicated they like classical music very much achieved higher recognition scores than did those who indicated they like classical music moderately, some, or were neutral in their like for such music. The scores of those subjects in the "like moderately," "like some," and "neutral" categories do not seem to differ appreciably from each other, but they are higher than the scores of those who indicated some degree of dislike for classical music.

TABLE 25

MEAN RECOGNITION SCORES GROUPED ACCORDING TO MUSICAL PREFERENCES

Musical Category	Like (7)	(6)	(5)	Neutral (4)	(3)	(2)	Dislike (1)
Classical	N=838 48.01	N=549 41.35	N=265 39.82	N=174 41.06	N= 39 33.10	N= 33 31.61	N= 17 32.41
Currently Popular	N=640 42.04	N=593 43.11	N=249 44.21	N=218 45.67	N= 78 48.71	N= 83 41.98	N= 54 47.75
Jazz	N=466 45.67	N=524 43.61	N=393 42.25	N=275 41.72	N= 97 43.75	N=100 43.93	N= 60 40.95
Folk	N=581 43.27	N=606 44.90	N=365 43.13	N=221 42.44	N= 64 41.00	N= 51 42.84	N= 27 37.70
Rock and Roll	N=399 41.41	N=576 41.45	N=303 43.88	N=243 46.06	N=129 44.99	N=123 45.92	N=142 46.96

The mean recognition scores achieved by students who indicated various degrees of liking for popular music seemed to be lower than those achieved by students who indicated dislike or neutral attitudes toward this kind of music. An exception to this was the "dislike moderately" category, which contained the lowest mean recognition score of any of the like-dislike categories applied to currently popular music. The patterns of differences between the mean recognition scores in the various like-dislike categories within the folk music and jazz music groupings were not clear. The students who indicated dislike for rock and roll music scored higher on the recognition test than did those who indicated a neutral or positive attitude toward this music.

In order to examine the statistical significance of the differences between the mean scores achieved by students who indicated different amounts of like or dislike for each of the five categories of music, a series of analysis of variance problems was calculated. The results of these analyses are shown in Table 26.

TABLE 26

ANALYSIS OF VARIANCE OF RECOGNITION SCORES: CATEGORY VARIABLE--DEGREE OF LIKE-DISLIKE FOR DIFFERENT TYPES OF MUSIC

Musical Category	Source of Variance	Sum of Squares	df	Mean Square	F	Probability
Classical	Between	36959.115	6	6159.853	15.344	.005*
	Within	765971.631	1908	401.453		
	Total	802930.746	1914			
Currently Popular	Between	5902.788	6	983.798	2.355	.03*
	Within	797027.958	1908	417.730		
	Total	802930.746	1914			
Jazz	Between	4091.439	6	681.907	1.629	.13
	Within	798839.307	1908	418.679		
	Total	802930.746	1914			
Folk	Between	2849.471	6	474.912	1.133	.34
	Within	800081.275	1908	419.330		
	Total	802930.746	1194			
Rock and Roll	Between	7465.833	6	1244.306	2.985	.01*
	Within	795464.913	1908	416.910		
	Total	802930.746	1194			

*Statistically Significant

The data shown in Table 26 indicate that the apparent differences between the recognition scores achieved by students who indicated various degrees of like or dislike for jazz and for folk music were not great enough to achieve statistical significance at the .05 level. This means that they may have been caused by sampling error rather than by real differences in recognition. The differences between the recognition scores in the various like-dislike categories in each of the classical music, currently popular music, and rock and roll music groups, however, were statistically significant. In general, it seems that the greater the degree of liking a subject indicated for rock and roll, or for currently popular music, the lower he tended to score on the test of recognition. Conversely, the students who indicated neutral attitudes or dislike for rock and roll and currently popular music tended to make higher scores on the test of recognition. Students who indicated much liking for classical music scored appreciably higher on the test of recognition than did those who indicated moderate liking, some liking, or a neutral attitude, while the students who indicated dislike for classical music tended to achieve still lower recognition scores.

It was believed that the music majors, whose mean recognition score was about 15 points higher than that of the nonmusic majors, might have been influenced by social or other pressures to indicate higher than normal degrees of liking for classical music or dislike for the other categories of music. Therefore the analysis was repeated separately for each of the three groups -- music majors, nonmusic majors, and high school students. Analysis of variance of the scores achieved by music majors, the results of which are shown in Table 27, indicated that only in the classical music category were the differences between the mean recognition scores in the various like-dislike categories sufficient to achieve statistical significance.

TABLE 27

ANALYSIS OF VARIANCE OF RECOGNITION SCORES ACHIEVED BY MUSIC MAJORS: CATEGORY VARIABLE--DEGREE OF LIKE-DISLIKE FOR DIFFERENT TYPES OF MUSIC

Musical Category	Source of Variance	Sum of Squares	*df*	Mean Square	*F*	Probability
Classical	Between	2349.215	6	391.536	2.293	.03*
	Within	63354.607	371	170.767		
	Total	65703.823	377			
Currently Popular	Between	1443.220	6	240.537	1.389	.22
	Within	64260.603	371	173.209		
	Total	65703.823	377			
Jazz	Between	720.936	6	120.156	0.686	.66
	Within	64982.887	371	175.156		
	Total	65703.823	377			
Folk	Between	1038.834	6	173.139	0.993	.43
	Within	64664.988	371	174.299		
	Total	65703.823	377			
Rock and Roll	Between	841.859	6	140.176	0.802	.57
	Within	64862.764	371	174.832		
	Total	65703.823	377			

*Statistically Significant

The pattern of mean scores in the classical music category, the only one shown in Table 27 to contain a significant *F* ratio, was very irregular. The number of students and the mean score for each like-dislike category in the classical music classification are shown in Table 28. It can be seen from these data that few of the music majors expressed dislike for classical music. Almost 75 percent of them indicated they like classical music very much; over 16 percent indicated they like classical music moderately. Thus, there was not much variation in the degree of liking for classical music expressed by the music majors who participated in this study.

TABLE 28

MEAN RECOGNITION SCORES ACHIEVED BY MUSIC MAJORS GROUPED
ACCORDING TO DEGREE OF LIKE-DISLIKE FOR
CLASSICAL MUSIC

Degree of Like-Dislike	Number in Category	Mean
Like Very Much (7)	283	56.53
Like Moderately (6)	63	53.73
Like Some (5)	8	44.50
Neutral (4)	20	52.20
Dislike Some (3)	1	41.00
Dislike Moderately (2)	1	58.00
Dislike Very Much (1)	2	40.50

The data indicate the presence of some relationship between the degree of like or dislike expressed for classical music by music majors and the scores they achieved on the test of recognition, but the pattern of differences revealed by the mean recognition scores seems somewhat ambiguous. This ambiguity results largely from the responses of "neutral" or lower by only 24 (6.3 percent) of the 378 music majors.

The data for music majors reveal that there is no association between different amounts of like or dislike expressed for jazz, folk, rock and roll, or currently popular music and different scores achieved on the test of recognition. There seems to be some association between the degree of like or dislike expressed for classical music and the score achieved on the recognition test.

The analysis of variance problems based on the scores achieved by nonmusic majors revealed that only in the classical music category was there a statistically significant defference between the recognition scores achieved by students who indicated different degrees of like or dislike for the music. The data from these analysis of variance calculations are shown in Table 29. The mean score and the number of students in each like-dislike category for classical music are shown in Table 30. The pattern of mean score differences shown in this table is much clearer than that evidenced in Table 28 for music majors. The nonmusic majors who indicated they like classical music very much achieved a mean score 3.71 points higher than the students who indicated they like classical music moderately. The differences between the "like moderately," "like some," and "neutral" categories are 1.49 points or less. Students who indicated some degree of dislike for classical music scored appreciably lower than did those who indicated neutral attitudes or some degree of liking.

TABLE 29

ANALYSIS OF VARIANCE OF RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS: CATEGORY VARIABLE--DEGREE OF LIKE-DISLIKE FOR DIFFERENT TYPES OF MUSIC

Musical Category	Source of Variance	Sum of Squares	df	Mean Square	F	Probability
Classical	Between	8961.198	6	1493.544	3.365	.005*
	Within	526914.681	1187	443.905		
	Total	535875.879	1193			
Currently Popular	Between	919.659	6	153.276	0.340	.92
	Within	534956.220	1187	450.679		
	Total	535875.879	1193			
Jazz	Between	2671.519	6	445.253	0.991	.43
	Within	533204.360	1187	449.203		
	Total	535875.879	1193			
Folk	Between	2213.207	6	368.868	0.821	.56
	Within	533662.672	1187	449.589		
	Total	535875.879	1193			
Rock and Roll	Between	2216.630	6	369.438	0.822	.55
	Within	533659.249	1187	449.586		
	Total	535875.879	1193			

*Statistically Significant

A series of t tests showed that the mean score achieved by nonmusic majors who indicated they like classical music very much (43.08) was significantly higher than that achieved by those who indicated moderate liking for such music (39.37). The t value of 2.489, with 804 degrees of freedom, was significant at the .05 level. The differences between the other adjacent categories were not statistically significant, although comparison of the mean score in the "neutral" category with the mean scores in the various dislike categories revealed differences which approached significance at the .05 level.

TABLE 30

MEAN RECOGNITION SCORES ACHIEVED BY NONMUSIC MAJORS GROUPED ACCORDING TO DEGREE OF LIKE-DISLIKE FOR CLASSICAL MUSIC

Degree of Like-Dislike	Number in Category	Mean
Like Very Much (7)	405	43.08
Like Moderately (6)	401	39.37
Like Some (5)	209	37.97
Neutral (4)	114	39.46
Dislike Some (3)	32	32.62
Dislike Moderately (2)	21	30.42
Dislike Very Much (1)	12	34.33

The data for nonmusic majors indicate that there is no association between degree of like or dislike expressed for jazz, folk, rock and roll, or currently popular music and scores achieved on the test of recognition. A significant relationship was found, however, between the degree of like-dislike expressed for classical music and the score achieved on the recognition test; students who indicated they like classical music very much scored significantly higher than students who indicated lesser degrees of liking.

The analysis of variance of the recognition scores achieved by high school students indicated that there were significant F ratios in the classical music and the folk music categories. The results of these analyses are shown in Table 31.

TABLE 31

ANALYSIS OF VARIANCE OF RECOGNITION SCORES ACHIEVED BY HIGH SCHOOL STUDENTS: CATEGORY VARIABLE--DEGREE OF LIKE-DISLIKE FOR DIFFERENT TYPES OF MUSIC

Musical Category	Source of Variance	Sum of Squares	df	Mean Square	F	Probability
Classical	Between	4819.855	6	803.309	2.116	.05*
	Within	127581.731	336	379.707		
	Total	132401.586	342			
Currently Popular	Between	2112.402	6	352.067	0.908	.49
	Within	130289.184	336	387.765		
	Total	132401.586	342			
Jazz	Between	1666.310	6	277.718	0.714	.64
	Within	130735.276	336	389.093		
	Total	132401.586	342			
Folk	Between	7864.257	6	1310.709	3.536	.005*
	Within	124537.329	336	370.647		
	Total	132401.586	342			
Rock and Roll	Between	4123.640	6	687.273	1.800	.10
	Within	128277.946	336	381.779		
	Total	132401.586	342			

*Statistically Significant

The number of students and the mean recognition score for each of the like-dislike categories for both classical music and folk music are shown in Table 32. Observation of these data shows that, in both categories, high school students who indicated greater amounts of liking for the music tended to achieve higher recognition scores, and students who indicated greater amounts of dislike for the music tended to achieve lower recognition scores.

TABLE 32

MEAN RECOGNITION SCORES ACHIEVED BY HIGH SCHOOL STUDENTS GROUPED ACCORDING TO DEGREE OF LIKE-DISLIKE FOR CLASSICAL MUSIC AND FOR FOLK MUSIC

Degree of Like-Dislike	Classical Music N	Classical Music Mean	Folk Music N	Folk Music Mean
Like Very Much (7)	150	45.25	100	46.40
Like Moderately (6)	85	41.47	76	46.32
Like Some (5)	48	42.64	77	42.26
Neutral (4)	40	40.03	60	34.70
Dislike Some (3)	6	34.33	11	32.45
Dislike Moderately (2)	11	31.45	11	38.63
Dislike Very Much (1)	3	19.33	8	36.37

The data for high school students indicate that there is no association between different amounts of like or dislike expressed for jazz, rock and roll, or currently popular music and different scores achieved on the test of recognition. A significant relationship was found, however, between the degree of like-dislike expressed for classical music or for folk music and the score achieved on the recognition test.

The separate analyses for music majors, nonmusic majors, and high school students confirm the finding for the total group that students who indicated they like classical music very much tended to achieve higher recognition scores than did students who indicated lesser degrees of liking for such music. The separate analyses obscured the slight negative relationship between recognition scores and liking for rock and roll and currently popular music which was found in the analysis of the total population, but they revealed a positive relationship between recognition scores and liking for folk music expressed by the high school students.

A series of correlation coefficients calculated between recognition scores and the degrees of like-dislike indicated for the various kinds of music confirmed the results of the analysis of variance comparisons for the total group. These coefficients, which are presented in Table 33, are very low. Even the highest of them indicates such a small association that neither variable could be used effectively to predict the other.

TABLE 33

COEFFICIENTS OF CORRELATION BETWEEN RECOGNITION SCORES AND DEGREE OF LIKE-DISLIKE FOR VARIOUS TYPES OF MUSIC

Variables Correlated	Coefficient	Probability
Recognition Score x Like-Dislike for Rock and Roll	-0.090	<.01*
Recognition Score x Like-Dislike for Currently Popular	-0.064	<.05*
Recognition Score x Like-Dislike for Folk	0.035	>.05
Recognition Score x Like-Dislike for Jazz	0.048	>.05
Recognition Score x Like-Dislike for Classical	0.192	<.01*

*Statistically Significant

The coefficient between recognition scores and the degree of like-dislike for folk music, and that between recognition scores and degree of like-dislike for jazz, did not achieve statistical significance. The positive coefficient of correlation between liking for classical music and recognition scores, although low, was statistically significant; so were the low negative correlations between recognition scores and liking for currently popular or rock and roll music.

Each subject was asked to choose his favorite kind of music from among the five alternatives: classical, currently popular, jazz, folk, and rock and roll music. The number of subjects who chose each category as favorite and the mean recognition scores achieved by those subjects are presented in Table 34.

TABLE 34

MEAN RECOGNITION SCORES ACHIEVED BY SUBJECTS WHO INDICATED DIFFERENT KINDS OF MUSIC AS THEIR FAVORITE

Favorite	Music Majors	Nonmusic Majors	High School Students	Total
Classical	N=278 56.18	N=328 42.88	N=116 44.94	N=722 48.33
Currently Popular	N= 27 54.55	N=437 38.76	N= 96 41.94	N=560 40.07
Rock and Roll	N= 3 48.80	N= 88 41.28	N= 43 39.23	N=134 40.78
Folk	N= 19 54.58	N=214 37.60	N= 35 43.71	N=268 39.60
Jazz	N= 51 52.78	N=126 40.20	N= 53 39.85	N=230 42.91

Inspection of Table 34 shows that in each group, the students who chose classical music as their favorite achieved higher mean recognition scores than the subjects who chose other kinds of music as their favorite. There does not seem to be any consistency otherwise to the pattern of the scores within the groups. A series of analysis of variance computations, the results of which are shown in Table 35, indicated that for music majors and for high school students, the mean recognition scores in the various categories did not differ sufficiently to achieve statistical significance. The mean recognition scores in the various categories of musical favorite did differ significantly in the nonmusic major and the total group analyses. (The presence of the extra degree of freedom in the between groups section of the analyses for nonmusic majors and the total group was caused by the miscoding of a single student's data into an extra category for the analysis by musical favorite. The effect of this was to lower the F ratio for these two analyses.)

For the total group, the mean recognition score achieved by the students who indicated classical music as their favorite was appreciably higher than the mean score achieved by students who indicated other kinds of music as their favorites. However, the differences between the mean scores achieved by students who indicated jazz, rock and roll, folk, or currently popular music as their favorites did not seem to vary appreciably. A series of t tests showed that the mean score in the classical music category was significantly higher than the next highest mean, that in the jazz category (t

value of 2.962 with 650 degrees of freedom, probability $< .01$). The means of the jazz, rock and roll, folk, and currently popular categories did not differ significantly from each other.

TABLE 35

ANALYSIS OF VARIANCE OF RECOGNITION SCORES: CATEGORY VARIABLE--FAVORITE

Group	Source of Variance	Sum of Squares	df	Mean Square	F	Probability
Music	Between	711.533	4	177.883	1.021	.40
	Within	64992.289	373	174.242		
	Total	65703.823	377			
Nonmusic	Between	4967.293	5	993.458	2.223	.05*
	Within	530908.586	1188	446.893		
	Total	535875.879	1193			
High School	Between	1607.547	4	401.887	1.038	.39
	Within	130794.039	338	386.965		
	Total	132401.586	342			
Total	Between	28901.866	5	5780.373	14.256	.005*
	Within	774028.881	1909	405.463		
	Total	802930.747	1914			

*Statistically Significant

The differences between the mean scores achieved by nonmusic majors who indicated different types of music as their favorite were not as large as those between the total group mean scores. The mean of the highest category, classical music, was significantly higher than the two lowest means, those of the folk and currently popular music categories (_t_ values of 2.994 and 2.624 with 570 and 763 degrees of freedom, respectively; probability $< .01$ in both cases).

No other pairs of mean scores differed significantly.

It seems that for the entire group of subjects tested, there is some association between the favorite kind of music indicated and the score achieved on the test of recognition. The students who indicated classical music as their favorite tended to achieve higher recognition scores than did the students who indicated other types of music as their favorites. This association seemed to hold for nonmusic majors, but not for music majors or high school students when their scores were analyzed separately.

The Association of Recognition Scores and Affective Response

The analysis of the association of recognition scores and affective response was approached in two ways. Analysis was made of the correlation between recognition scores and like-dislike scores on each item of the test, and between total recognition scores and total like-dislike scores. Table 36 shows the correlation coefficients for like-dislike and recognition scores on each of the 14 test items. All of the correlation coefficients were positive, but so low as to be of little or no practical value. Eleven of them proved to be statistically significant; that is, they were not likely to have occurred by chance. Thus it can be said that, in general, there is a positive correlation between the degree of like-dislike expressed for the specific music in which repeated and altered themes were recognized and the recognition score achieved on that particular item of the test. However, the correlation is so small that it would be of no value in predicting one variable from the other.

TABLE 36

RECOGNITION SCORE-AFFECTIVE RESPONSE CORRELATION COEFFICIENTS FOR INDIVIDUAL TEST ITEMS

Item Name	Correlation Coefficient	Probability	Item Name	Correlation Coefficient	Probability
Mozart No. 12	+0.082	<.01*	Tschaikovsky	+0.131	<.01*
Dello Joio	+0.071	<.05*	Schubert	+0.079	<.05*
Haydn No. 94	+0.034	>.05	Walton	+0.103	<.01*
Prokofieff No. 1 3rd Movement	+0.106	<.01*	Haydn No. 96	+0.049	>.05
Diamond	+0.173	<.01*	Elgar	+0.087	<.01*
Prokofieff No. 1 2nd Movement	+0.173	<.01*	Mozart No. 13	+0.053	>.05
Gliere	+0.159	<.01*	Kodaly	+0.083	<.01*

*Statistically Significant

Correlation coefficients between total recognition scores and total affect scores were calculated for each of the three groups -- music majors, nonmusic majors, and high school students -- and for the total group. These coefficients are shown in Table 37. Each of the coefficients was high enough to achieve statistical significance at the .01 level, but so low as to be of little or no practical significance. These data indicate that there was a low, positive relationship between total affect scores and total recognition scores achieved by the subjects tested in this study. The correlation coefficients are not high enough, however, to be useful for predictive purposes.

TABLE 37

TOTAL RECOGNITION SCORE-TOTAL AFFECTIVE RESPONSE SCORE CORRELATION COEFFICIENTS

Group	Correlation Coefficient	Probability
Music Majors	+0.146	<.01*
Nonmusic Majors	+0.120	<.01*
High School Students	+0.141	<.01*
Total Group	+0.192	<.01*

*Statistically Significant

The data from both the analysis of individual items and the analysis of total affect and total recognition scores seem to indicate that there is a low, but positive, correlation between the liking expressed for the music of the test of recognition and the recognition score achieved.

The Association of Recognition Scores and Academic Aptitude

The measure used to estimate academic aptitude for the purposes of this study was the cumulative grade point average. This choice was made on the assumption that academic performance is highly correlated with academic aptitude. Grade point averages were gathered from the college records of the students who participated in this study and, when necessary, were converted to a four-point scale. The mean grade point average of the music majors was 2.166 with a standard deviation of 1.285, while the mean grade point average of the nonmusic majors was 2.036 with a standard deviation of 1.075. Correlation coefficients were calculated between cumulative grade point average and recognition scores for the music students and the nonmusic students separately, and for the college sample as a whole. The results of these calculations are shown in Table 38.

TABLE 38

RECOGNITION SCORE-GRADE POINT AVERAGE CORRELATION COEFFICIENTS

Group	Correlation Coefficient	Probability
Music Majors	-0.017	>.05
Nonmusic Majors	+0.077	<.05*
Total College Sample	+0.065	<.05*

*Statistically Significant

The data presented in Table 38 show that the correlation coefficient between the grade point averages and the recognition scores achieved by the music majors did not achieve statistical significance; that is, it is likely to be the result of sampling error. The coefficients of correlation between grade point average and recognition test score for nonmusic majors and for the total group were positive in direction and high enough to achieve statistical significance at the .05 level. They were, however, too low to be useful for purposes of prediction. These data seem to indicate that there is little or no relationship between the recognition of repeated and altered themes in music, as measured, and academic aptitude. In evaluating this information, it is necessary to take into consideration the fact that the subjects in this analysis were all college students, and thus represented an attenuated spread of academic aptitude.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Purpose of the Study

The purpose of this study was to measure the recognition of repeated and altered themes in music, and to investigate the association of these recognitions, as measured, with different kinds and amounts of musical experience, musical preferences, like or dislike for the music in which the themes were repeated or altered, and cumulative grade point average.

Background of the Problem

The offering of music courses in the public schools of the United States has been justified variously on the basis of intrinsic and extrinsic values. In the exigencies of teaching in the public schools, many music educators have developed programs which tend to emphasize the latter rather than the former. However, several causes have led music educators to devote increasing attention to programs of instruction based upon intrinsic purposes for the teaching of music. This increased attention to intrinsic values has led to renewed interest in teaching for the development of sensitivity to, and appreciation of, art music. Some procedures of music education based on these purposes are intended to help students develop skill in recognizing and discriminating tonal relationships in music.

The repetition and alteration of thematic material is an important characteristic of the music which music educators hope to teach. The present study provides an estimate of the association of the recognition of repeated and altered themes with different kinds and amounts of musical experience within and without the school music program.

Music educators are interested in developing several aspects of appreciation for music among their students. They hope that their students will learn to evaluate music, and respond affectively to it. The data gathered in this study provide some information for use in evaluating the association between recognition of tonal relationships in music and affective response to that music.

Review of Related Literature

Research into music listening, in attempting to isolate variables, has tended to be concerned with recognition of stimuli abstracted from the complex musical stimulus rather than with listening to music *per se*. Such studies of isolated tonal stimuli depend primarily for their results on the autochthonous properties of the nervous system. They are investigations of discriminations which are influenced primarily, but not exclusively, by genetic capacity rather than by learned skills in the use of that capacity. Listening to a complex work of music, however, although based upon genetic capacity, depends on learned skills in the use of that capacity.

Several studies were cited to confirm that musical stimuli can be cognized in a variety of ways, and that recognitions of tonal relationships such as those under investigation in the present study have been demonstrated in other research.

A number of studies of the relationship between musical experience and the recognition of tonal relationships in complex musical stimuli were reviewed. These studies resulted in various conclusions. Some gave evidence of definite, positive, and seemingly causal relationships between musical experience and measured listening skills, while others showed low, negligible, or nonexistent relationships between these factors. Some of this variety of conclusions was probably caused by the different sorts of "musical experience" evaluated in the different studies. Most of the studies indicated that persons with musical training tend to make higher scores on musical listening tests than do persons without musical training. Different amounts and different kinds of musical training seem to be associated with different musical listening test scores, although there are indications that these relationships are not of the simple, linear sort.

Because repetition and alteration of themes in Western art music is often based on the manipulation of melodic materials, literature concerning the recognition of melody in music was cited. It was shown that the ease with which a theme can be cognized and remembered depends upon a number of factors, including the complexity of the melodic sequence. For persons in Western culture, it is possible to arrange different melodic structures on a continuum of complexity, and thus to arrange a sequence of increasing difficulty of cognition and re-cognition.

Studies of the relationship between academic ability and musical aptitude were reviewed. In most of these studies, academic ability was estimated by intelligence test scores, and musical aptitude was measured by standardized tests of musical ability or musical talent. When musical aptitude was measured by tests based on the recognitions of tonal stimuli dependent for the most part on the autochthonous properties of the sensory system, its demonstrated relationship with intelligence was low. When measures of musical ability were based on more complex musical tasks, the relationship between musical ability and intelligence seemed to be higher.

The relationships between the hearing of musical stimuli and affective responses to those stimuli also have been studied by a number of investigators. Some of these studies were concerned with the influence of repetition of the musical stimulus upon affective response. Several of them demonstrated that repeated listening to the same music was accompanied by affective shift, a shift which was positive in direction in the cases of sophisticated, complex musical stimuli.

Procedure

An audio-visual testing device was constructed to measure recognition of repeated and altered themes in 14 musical items, and affective response to the same items on a seven-point continuum of like-dislike. The answer booklet for this test contained a questionnaire to gather data about each subject's musical experiences and preferences. The test and questionnaire were evaluated and revised in a series of three pilot studies before the data were gathered for the study proper. The music for the test items was selected from works composed between 1600 and the present day, and represented forms including the song form, the theme and variations, the rondo, and the canon. The musical items ranged in length from less than one to almost three minutes, and the entire test, including the questionnaire section, took about 45 minutes to administer.

The total sample tested was 1,914 persons. The test was administered to 1,572 college and university students, both music and nonmusic majors, in four midwestern states, and to 342 high school students in Michigan. Individual item recognition scores, total test recognition scores, individual item affect scores, and total test affect scores were obtained for each subject who took the test. Cumulative grade point averages were obtained from the school records of the college students who served as subjects for the study; these averages were used as estimators of academic aptitude in the analysis of the data. All of the test, questionnaire, and grade point data for each subject were punched on cards for computer processing. The computations and statistical analysis of data were done on the Control Data 3600 computer at Michigan State University. Information gained from the questionnaire was used to cast the recognition scores achieved by the subjects into various groups for the purposes of analysis. Statistical tests used included the analysis of variance, the t test, and the product-moment coefficient of correlation.

Presentation and Analysis of the Data

The mean recognition score for the entire sample of 1,914 students was 43.50. The mean score achieved by music majors was 55.46. This score was significantly higher than the mean of 40.01 achieved by nonmusic majors and the mean of 42.42 achieved by high school students. The difference between the means achieved by nonmusic majors and high school students was not statistically significant. There were no statistically significant differences between the mean scores achieved by students at the various class levels.

When the recognition scores achieved by music majors were cast into categories representing different kinds or combinations of experience in musical performance activity, it was found that the differences between the mean scores in the band; orchestra; chorus; band and orchestra; band and chorus; orchestra and chorus; band, orchestra, and chorus; and piano only categories were not statistically significant. A similar lack of significant differences was found among the scores achieved by the high school students. Among the nonmusic majors, however, there were several significant differences. The highest mean recognition score was achieved by the students who had participated in a combination of band, orchestra, and chorus. Students who had participated in chorus, or in chorus in combination with band and/or orchestra scored significantly higher than those who had participated in band alone, piano alone, or had had no performance experience. There were no statistically significant differences between the mean scores in the latter three categories.

When the recognition scores were cast into categories representing different total amounts of experience in performance activities, statistically significant differences were found within the nonmusic major and the high school student groups. There were no statistically significant differences among the scores achieved by the music majors. Among the nonmusic majors and high school students, persons at progressively higher levels of total amount of experience in performance activities tended to achieve progressively higher recognition scores. In the categories higher than 11-15 years of experience, further increases in amount of performance experience were not accompanied by higher recognition scores.

Analysis of the interaction of amount and kind of performance experience indicated that, among nonmusic majors, students who had participated in combinations of activities including chorus tended to achieve higher scores on the test of recognition than did students who had had an equal amount of experience in a single instrumental activity.

When the recognition scores were cast into categories representing different total amounts of guided and unguided listening experience, it was found that both music and nonmusic majors who indicated progressively higher amounts of listening experience tended to achieve progressively higher recognition scores. This association was not found in the analysis of the scores achieved by the high school students. None of the high school students had accumulated enough listening experience to be classified in the "much" experience category.

There was no significant relationship between the total number of years of academic study of music in college courses in theory, history, and literature, and the score achieved on the recognition test. Only the music majors had had enough academic study of music to provide data for a meaningful analysis.

Investigation of the association of recognition scores and musical preferences for the total group revealed that students who indicated they like classical music very much tended to achieve higher scores on the test of recognition than did students who indicated lesser degrees of liking or neutral attitudes toward such music. The latter groups, however, tended to achieve higher mean recognition scores than did the students who indicated dislike for classical music. Inverse relationships were found between amount of liking expressed for rock and roll music, or currently popular music, and recognition scores achieved. No association was found between like-dislike for jazz or folk music and recognition scores. These analyses were repeated separately for the music majors, nonmusic majors, and high school students. In each case the positive association between amount of liking expressed for classical music and recognition score achieved was upheld. The inverse relationships between liking for rock and roll, or currently popular music, and recognition scores were not found in any of these three groups. A positive association was found between liking for folk music and recognition scores achieved by high school students.

The subjects were asked to choose their favorite type of music from among categories labeled "classical," "currently popular," "jazz," "folk," and "rock and roll." No statistically significant differences were found between the mean recognition scores achieved by music majors who indicated different types of music as their favorite, nor were any significant differences found between the mean scores achieved by high school students. When the scores of the nonmusic majors and the total group were analyzed, it was found that those students who chose classical music as their favorite tended to achieve higher scores on the test of recognition than did those who chose one of the other types of music as favorite.

Calculation of the correlation coefficients between recognition scores and affect scores achieved on the individual items of the test yielded statistically significant positive correlations on 11 of the 14 items, but the coefficients were so low as to have little or no predictive value (the highest r was +0.173). The coefficients of correlation between total affect score and total recognition score were calculated for music majors, nonmusic majors, high school students, and the total group. In each case the correlation was positive and statistically significant, but too low to have any important predictive value. The highest coefficient was that for the total group (+0.192).

An analysis of the association of academic aptitude and recognition scores achieved was made by calculating the correlation coefficients between the cumulative grade point averages and the recognition scores achieved by the college students tested in this study. No relationship having any predictive value was found.

Answers to the Questions Asked in this Study

Following are the questions posed for this study and their answers based upon the data obtained:

1. To what extent are repeated and altered thematic material in music recognized by freshman, sophomore, junior, senior, and graduate music majors in college?

   Out of 124 possible points, music majors achieved a mean recognition score of 55.46 points. There were no statistically significant differences between the mean scores achieved by the freshman, sophomore, junior, senior, and graduate music majors who participated in this study.

2. To what extent are repeated and altered thematic material in music recognized by high school students and by freshman, sophomore, junior, senior, and graduate nonmusic majors in college?

   Out of 124 possible points, high school students achieved a mean recognition score of 42.42 points, and nonmusic major college students achieved a mean score of 40.01 points. There were no statistically significant differences between the mean scores achieved by freshman, sophomore, junior, and senior high school students, nor between the mean scores achieved by freshman, sophomore, junior, senior, and graduate nonmusic majors in college. The difference between the mean scores achieved by high school students and college nonmusic majors was not statistically significant.

3. Is there any significant difference between the mean recognition scores made by music and nonmusic majors?

   The mean recognition score achieved by music majors was 15.45 points higher than that achieved by nonmusic majors. This difference was statistically significant beyond the .01 level.

4. In what way are the recognitions measured associated with experience in different musical performance activities? Are there any significant differences between the mean scores achieved by groups of students who have participated in the following activities?

   A. Band.
   B. Orchestra.
   C. Chorus.
   D. Band and Orchestra.
   E. Band and Chorus.
   F. Orchestra and Chorus.
   G. Band, Orchestra, and Chorus.
   H. Private Piano Lessons.
   I. None.

   The nonmusic majors achieved mean recognition scores which ranked the performance categories in the following descending order: band, orchestra, and chorus (49.71); orchestra and chorus (44.76); band and chorus (44.72); chorus (41.11); band and orchestra (38.06); band (36.42); piano only (35.82); and none (34.62). The differences between the mean scores achieved by those who had had no performance experience and those who had participated in piano only, band, orchestra, or a combination of band and orchestra were not statistically significant. Those who had participated in chorus alone, or chorus in combination with band and/or orchestra, achieved a significantly higher score than those who had participated only in piano or band. The differences found among the scores achieved by nonmusic majors were not evident among those achieved by the high school students or the music majors. Among the latter two groups, none of the differences between mean scores in the various categories of musical performance experience achieved statistical significance.

5. In what way are the recognitions measured associated with different amounts of experience in the different musical performance activities listed in number 4?

   Among nonmusic majors and high school students, groups of persons who had had progressively greater total composite amounts of experience in performance activities generally achieved progressively higher mean scores on the test of recognition. Among music majors the differences between the mean recognition scores in the various amount of performance experience categories were not statistically significant. There was some tentative evidence that among nonmusic majors, those who had had a given amount of experience in a combination of chorus and band and/or orchestra scored significantly higher than those who had had an equal total amount of experience in piano alone or band alone.

6. In what way are the recognitions measured associated with various amounts of experience in listening to music, as estimated from a combined rating of amount of teacher-guided listening experience, amount of unguided listening experience, and amount of recital and concert attendance?

   Among the college music majors and nonmusic majors, those who had had much listening experience scored significantly higher on the test of recognition than those who had had little or no listening experience. The nonmusic majors achieved the following mean scores in the three categories representing amount of listening experience: much (46.36); some (40.66); and little or none (37.16). The differences between the mean scores in these three categories were statistically significant. The music majors achieved the following mean scores: much (56.17); some (56.66); and little or none (48.88). The mean of the little or none category was significantly lower than the means of the other two categories, but the difference between the means of the much and the some categories was not statistically significant. None of the high school students tested had had enough listening experience to be classified in the category of much listening experience. The difference between the mean scores achieved by the high school students in the some (43.31) and the little or none (42.04) categories was not statistically significant.

7. In what way are the recognitions measured associated with different amounts of formal study of music in courses of music theory, history, and literature?

   Only the music students tested had had enough academic study of music in such courses to allow meaningful analysis. There was no association between the number of years of academic study of music in courses of music theory, history, and literature and the scores achieved on the test of recognition by music majors.

8. In what way are the recognitions measured associated with different levels of academic aptitude, as estimated by cumulative grade point average?

   The coefficient of correlation between cumulative grade point averages and recognition scores achieved by non-music majors, although statistically significant, was so low as to be of no practical value. The correlation coefficient between these variables for music majors was not statistically significant. Grade point averages were not available for the high school students tested in this study.

9. In what way are the recognitions measured associated with musical preferences? How are they associated with preference for classical music, jazz music, folk music, currently popular music, and rock and roll music?

   Students who indicated very much liking for classical music achieved higher mean recognition scores than did those students who indicated lesser degrees of liking or neutral attitudes toward classical music; the latter groups achieved higher scores than did those students who indicated varying degrees of dislike for such music. An inverse relationship seemed to hold between degree of liking for rock and roll music and recognition scores, and also between degree of liking for currently popular music and recognition scores. There was no significant association between expressed like or dislike for jazz or folk music and recognition score achieved. Students who indicated classical music as their favorite of the five types -- classical, jazz, folk, currently popular, and rock and roll -- scored significantly higher on the recognition test than did those who indicated one of the other types as being favored. There were no appreciable differences between the mean scores achieved by those students who indicated favorites among the other four types of music.

10. In what way are the recognitions measured associated with reports of liking-disliking of the music of the items of the recognition test?

    The coefficients of correlation between recognition and affect scores were statistically significant for 11 of the 14 individual items, but were so low as to be of no predictive value. The correlation coefficient between total recognition and total affect scores, although statistically significant, was too low to be of any practical significance.

Conclusions and Recommendations

Although the data gathered in this study do not provide evidence of causal relationships, several conclusions can be drawn, and recommendations developed, from them. There is a difference between the recognition scores achieved by music majors and nonmusic majors which does not seem to be associated with any of the variables investigated in this study. It is recommended that further investigation be undertaken to seek the source of this difference.

Participation in piano lessons, or in band only, seems to have little effect in enabling students to develop the listening skills measured in this study. From the data it seems possible that participation in chorus, or in chorus in combination with instrumental activities, is somewhat more effective in enabling students to develop these listening skills. However, participation in performance activities in general seemed, from the data, to have only a minor association with the listening skills measured. Many years of participation in these activities seemed to be necessary before any appreciable increase in recognition scores became evident. Such performance activities comprise the bulk of the music curriculum in the secondary school. It seems that music educators, if they want to better align their statements and their practice, have three possible courses of action: (1) to revise the goals of music education to eliminate the development of listening skills, at least of the sort measured in this study, as a major aim; (2) to reorganize the teaching of performance groups so as to place more emphasis on the development of these listening skills; or (3) to revise the music curriculum to provide courses in which these skills are more effectively taught.

The recognition skills measured in this study seemed to be associated with listening experience. A refined investigation of the nature of the listening experiences most effective in developing such recognition skills should provide data that would be of use to music educators in planning revisions of the music curriculum or the reorganization of the teaching of performance groups.

The recognition skills measured in this study did not seem to be associated with the total amount of academic study in courses of music theory, history, and literature. A more refined investigation of this relationship might reveal whether or not specific courses such as ear training and form and analysis have any influence in the development of such skills.

Little association was found between academic aptitude and the recognition scores achieved by the college students tested in this study. Pursuit of this investigation among the general population might result in knowledge, at least, of the lowest levels of academic aptitude necessary for the development of such listening skills.

A statistically significant, but very low, positive correlation was found between expressed preference for classical music and amount of listening skill exhibited on the test of recognition. The fact that this correlation is low indicates that many persons who expressed preference for classical music achieved low scores on the test of recognition, and that many persons who achieved high scores on the test of recognition indicated preference for other types of music. This evidence indicates that preference for classical music does not necessarily accompany the development of the listening skill measured in this study. Thus music educators, if they desire to develop a preference for classical music among their students, should not expect the development of such listening skills to result automatically in such a preference.

A low, positive correlation was found between the recognition score achieved on most items of the test and the degree of liking expressed for the music of those particular items. The fact that such correlation is low indicates that the exercise of the listening skill measured in this study does not guarantee that the listener will like the music in which he exercises the skill. Thus music educators, if they desire that their students develop a liking for a particular musical selection, should not expect the development among their students of the recognition of tonal relationships in that music -- at least the recognition of repeated and altered themes as measured in this study -- to guarantee the development of liking for that music.

If this investigation were to be pursued over a longer period of time, several changes in the testing procedure might prove to be worthwhile. More lengthy musical test items could be used to measure the recognition of the treatment of thematic materials in highly complex musical structures such as the sonata allegro form. The testing of subjects individually rather than in large group situations would allow the use of presently available behavior recording apparatus which would allow the subjects to give more precise indications of what they were hearing in the music.

Replication of the present study, and pursuit of similar studies of the recognition of other specific tonal relationships in music should provide valuable data for the use of music educators.

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APPENDIXES

APPENDIX A

Answer Booklet -- Final Version

ANSWER BOOKLET

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lease indicate your answer to each question by making a circle around the number that follows the orrect alternative.

. What is your college major? (Circle only one alternative.)

Some field of music	1	(6)
Some field other than music	2	

. What is your college classification this school term? (Circle only one alternative.)

Freshman	1	
Sophomore	2	
Junior	3	(7)
Senior	4	

. Including the seventh grade and all the time since, in what musical activity or combination of activities have you participated? (Circle one alternative plus alternative 0 if it is appropriate.)

Band	1	Orchestra and Chorus	6	
Orchestra	2	Band, Orchestra and Chorus	7	
Chorus (includes Glee Clubs)	3	Private Lessons only	8	
Band and Orchestra	4	None	9	(8)
Band and Chorus	5	The Alternative marked plus Private Lessons	0	

4. What is the composite total of years that you have participated in the activity or combination of activities listed above? (In figuring this total, count one for each year in each activity. For instance, if for two years you were in both band and chorus, your composite total would be four years. Circle only one alternative.)

None	1	7-10 years	5	
1-2 years	2	11-15 years	6	
3-4 years	3	16-20 years	7	(9)
5-6 years	4	21+ years	8	

5. How much time have you spent each week listening to music of any kind outside of school? (Circle one alternative for each school level.)

	None	1-5 hours	6-10 hours	11+ hours
Junior High	0	1	2	3
Senior High	0	1	2	3
College	0	1	2	3

6. How much teacher-guided work in listening to music have you done in school? (Circle one alternative for each school level.)

	Little or None	Some	Much	
Junior High	0	1	2	
Senior High	0	1	2	(10)
College	0	1	2	

7. How often have you attended concerts and recitals? (Circle one alternative for each school level.)

	Little or None	Some	Much
Junior High	0	1	2
Senior High	0	1	2
College	0	1	2

(Please be certain you have answered all the questions on page 4.)

7. Exact Repetition ________________

Altered Repetition ________________ (31-32)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (33)

8. Exact Repetition ________________

Altered Repetition ________________ (34-35)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (36)

9. Exact Repetition ________________

Altered Repetition ________________ (37-38)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (39)

10. Exact Repetition ________________

Altered Repetition ________________ (40-41)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (42)

11. Exact Repetition ________________

Altered Repetition ________________ (43-44)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (45)

12. Exact Repetition ________________

Altered Repetition ________________ (46-47)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (48)

13. Exact Repetition ________________

Altered Repetition ________________ (49-50)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (51)

14. Exact Repetition ________________

Altered Repetition ________________ (52-53)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (54)

15. Exact Repetition ________________

Altered Repetition ________________ (55-56)

LIKE 7 Very Much — 6 Moderate — 5 Mild — 4 Neutral — 3 Mild — 2 Moderate — 1 Very Much DISLIKE (57)

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(card

16. How well do you like Rock and Roll music?

LIKE	7	6	5	4	3	2	1	DISLIKE
	Very Much	Moderate	Mild	Neutral	Mild	Moderate	Very Much	

17. How well do you like music that is currently popular?

LIKE	7	6	5	4	3	2	1	DISLIKE
	Very Much	Moderate	Mild	Neutral	Mild	Moderate	Very Much	

18. How well do you like Folk music?

LIKE	7	6	5	4	3	2	1	DISLIKE
	Very Much	Moderate	Mild	Neutral	Mild	Moderate	Very Much	

19. How well do you like Jazz music?

LIKE	7	6	5	4	3	2	1	DISLIKE
	Very Much	Moderate	Mild	Neutral	Mild	Moderate	Very Much	

20. How well do you like Classical music?

LIKE	7	6	5	4	3	2	1	DISLIKE
	Very Much	Moderate	Mild	Neutral	Mild	Moderate	Very Much	

21. Which is your favorite of the following five kinds of music? (Circle only one alternative.

Currently popular	1
Rock and Roll	2
Folk	3
Jazz	4
Classical	5

22. For how many academic years have you taken college courses in each of the following subjects?

Sight Singing and Ear Training (Aural Harmony) . . . ____
Harmony . . . . ____
Advanced Music Theory . . . . ____
Music Appreciation . . . . ____
Music Literature . . . . ____
Music History . . . . ____

****

What is your name?______________________

What is your student number?______________________

(Your name will not be associated with your answers to any part of this questionnaire.)

(Please be certain you have answered all the questions on page 1.)

INSTRUCTIONS RECORDED ON THE TAPE OF THE FINAL VERSION

The first paragraph at the top of page 2 of the answer booklet was read. Then the recorded voice said:

> "Let us have an example of this before going on with the instructions. In an exact repetition of a theme, everything is exactly the same. An altered repetition has some change in melody, harmony, rhythm, tempo, key, loudness, pitch of performance, or performing instrument. For instance, here is the first theme of 'Twinkle, Twinkle, Little Star.'"

(At this point, the first theme was recorded, played on a piano.)

> "Here is an exact repetition of that theme."

(The music was played again.)

> "That was an exact repetition because everything was exactly the same. Here is an altered repetition of that theme."

(A version of the first theme was played which had an ornamented melody and a different harmonization.)

> "That repetition was altered in several ways. The melody was changed and the harmony was changed. Here is another altered repetition of the theme."

(A version of the first theme was played which had a dotted note figure and ornaments in the melody.)

> "This repetition was altered because the rhythm was changed and the melody was changed. Often the first theme and its repetitions are separated by other musical material. Thus, in 'Twinkle, Twinkle, Little Star,' a second theme is interjected between the first theme and its repetition. Listen!"

(The tune was played in its entirety. The first theme, when it was repeated, was played exactly as it was at the beginning of the song.)

> "Did you hear the first theme when it was repeated after the interjected material? It was an exact repetition, for it was exactly the same as it was at the beginning of the song. Now return to the second paragraph of the directions on page two and silently read them along with me."

(The remainder of the instructions were then read. At the end of the directions, the following statement was recorded on the tape of the test.)

> "Please do not sing along, or do anything else that might distract your neighbor. It may help if you listen with your eyes closed and look at the numerals only when you recognize a repetition. The musical items are played by an orchestra rather than by a piano as the example was. Your task, however, is the same. You are to listen for repetitions of the first theme in each item. Write down the number you see each time you recognize an exact or altered repetition. Here is item number one."

APPENDIX B

Answer Booklet -- First Version

INSTRUCTIONS

In many musical compositions, themes are introduced and then repeated at various times throughout the work. Sometimes the themes are repeated exactly, and other times they are repeated in altered form. Some musical compositions will now be played while a series of numbers is projected on the screen. In each of these musical selections, please listen carefully to the first theme. It may be long or short. Then, each time you hear the first theme repeated exactly, write on your answer sheet in the "Exact Repetition" row for that selection the number being projected on the screen. Likewise, each time you hear the first theme repeated in altered form, write in the "Altered Repetition" row for that selection the number being projected. In every case, write the number being projected at the time you recognize the first theme being repeated in exact or altered form.

During the brief pause after each selection, please circle on the "like-dislike" row for that selection the number that most closely indicates your degree of liking or disliking for that selection.

****

1. Exact Repetition____

Altered Repetition____

LIKE	1	2	3	4	5	6	7	DISLIKE
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme	

2. Exact Repetition____

Altered Repetition____

LIKE	1	2	3	4	5	6	7	DISLIKE
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme	

3. Exact Repetition____

Altered Repetition____

LIKE	1	2	3	4	5	6	7	DISLIKE
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme	

4. Exact Repetition____

Altered Repetition____

LIKE	1	2	3	4	5	6	7	DISLIKE
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme	

5. Exact Repetition______________________________

Altered Repetition______________________________

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

6. Exact Repetition______________________________

Altered Repetition______________________________

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

7. Exact Repetition______________________________

Altered Repetition______________________________

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

8. Exact Repetition______________________________

Altered Repetition______________________________

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

9. Exact Repetition______________________________

Altered Repetition______________________________

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

10. Exact Repetition______________________________

Altered Repetition______________________________

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

11. Exact Repetition______________________________

Altered Repetition______________________________

LIKE 1 2 3 4 5 6 7 DISLIKE

12. Exact Repetition____

Altered Repetition____

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

13. Exact Repetition____

Altered Repetition____

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

14. Exact Repetition____

Altered Repetition____

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

15. Exact Repetition____

Altered Repetition____

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

16. Exact Repetition____

Altered Repetition____

LIKE 1 2 3 4 5 6 7 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme

17. Including the 7th grade and every year since then, how many years (rounded off to the nearest year) have you participated in each of the following school music activities?

Band ______
Orchestra ______
Chorus or Glee Club ______
Class in General Music ______
Class in Music Appreciation ______
Class in Music Theory ______
Small Instrumental Ensembles ______
Small Vocal Ensembles ______

18. How many years of piano lessons have you taken? ______

19. How many years of voice lessons have you taken? ______

20. How many years of instrumental lessons have you taken? ______

21. How much teacher-guided work in listening to music have you been required to do in school?

	Very Much	Some	Little or None
Junior High	______	___	_____
Senior High	______	___	_____
College	______	___	_____

22. How much time have you spent each week listening to music of any kind outside of school?

	None	1-5 hours	6-10 hours	11+ hours
Junior High	___	___	___	___
Senior High	___	___	___	___
College	___	___	___	___

23. How often have you attended concerts and recitals?

	Very Often	Some	Little or None
Junior High	___	___	___
Senior High	___	___	___
College	___	___	___

24. How well do you like classical music?

Like	1	2	3	4	5	6	7	Dislike
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme	

25. How well do you like jazz?

Like 1 2 3 4 5 6 7 Dislike
Extreme Moderate Mild Neutral Mild Moderate Extreme

26. How well do you like rock and roll?

Like 1 2 3 4 5 6 7 Dislike
Extreme Moderate Mild Neutral Mild Moderate Extreme

27. How well do you like folk music?

Like 1 2 3 4 5 6 7 Dislike
Extreme Moderate Mild Neutral Mild Moderate Extreme

28. Which is your favorite among the following four types of music? Please check only one of the four.

Folk______ Rock and Roll_____ Jazz_____ Classical_____

29. What is your class status?

Freshman_____ Sophomore_____ Junior_____ Senior_____ Graduate_____

30. What is your major field of study (present or intended)?__________

31. What is your name?

32. What is the name of your school?____________________________

APPENDIX C

Answer Booklet -- Second Version

RESEARCH INVENTORY

Section I (Card 1)

****

In this section, indicate your answer to each question by making a circle around the number that follows the correct alternative. Please choose only one of the alternatives listed after each question, or each part of a question.

****

1. What is your college major?

Some field of music 1
Some field other than music 2 (6)

2. What is your college classification this school term?

Freshman 1
Sophomore 2 (7)
Junior 3
Senior 4

3. Including the seventh grade and all the time since, in what musical activity or combination of activities have you participated?

Band 1
Orchestra 2
Chorus (includes glee clubs) 3
Band and Orchestra 4
Band and Chorus 5
Orchestra and Chorus 6
Band, Orchestra and Chorus 7
Private lessons only 8
None of the above 9

4. What is the composite total of years that you have participated in the activity or combination of activities listed above? (In figuring this total, count one for each year in each activity--thus, if you were in both band and chorus during your Junior and Senior years in high school, your complete total would be four years.)

1-2 years 1
3-4 years 2
5-6 years 3
7+ years 4
None 5

5. How much time have you spent each week listening to music of any kind outside of school?

(a) Junior High:
None 1
1-5 hours 2
6-10 hours 3
11+ hours 4

(b) Senior High:
None 1
1-5 hours 2
6-10 hours 3
11+ hours 4

(c) College:
None 1
1-5 hours 2
6-10 hours 3
11+ hours 4

(Card 1, continued)

6. How much teacher-guided work in listening to music have you done in school?

(a) Junior High: Little or none 1
Some 2
Much 3

(b) Senior High: Little or none 1
Some 2
Much 3

(c) College: Little or none 1
Some 2
Much 3

7. How often have you attended concerts and recitals?

(a) Junior High: Little or none 1
Some 2
Much 3

______ (10)

(b) Senior High: Little or none 1
Some 2
Much 3

(c) College: Little or none 1
Some 2
Much 3

8. Which is your favorite of the following five kinds of music?
Rock and Roll 1
Currently Popular 2
Folk 3
Jazz 4
Classical 5

- -

What is your name?______________________________

What is your student number?______________________________

(This section will be detached from the test. No one will connect your name with any of your answers to any part of this inventory.)

Section II (Card 1, Continued)

****

In many musical compositions, themes are introduced and then repeated at various times throughout the work. Sometimes the themes are repeated exactly, and other times they are repeated in altered form. Fifteen musical selections will now be played while a series of numerals is projected on the screen. Each musical item will be announced by number. Listen carefully to the FIRST THEME of each item; then, during the remainder of the item, listen carefully for that theme, either in exact repetition or in altered repetition. Each time you hear the first theme repeated exactly, write the number being projected on the "exact repetition" line for that item on your answer sheet. Likewise, each time you hear the first theme being repeated in altered form, write the number being projected on the "altered repetition" line for that item. **IN EVERY CASE, WRITE THE NUMBER BEING PROJECTED AT THE EXACT TIME YOU RECOGNIZE THE FIRST THEME BEING REPEATED IN EXACT OR ALTERED FORM.** You do not have to write all the numbers that are projected throughout the duration of each repetition; only the number that is being projected when you first recognize each repetition. There will be more repetitions in some items than in others. In some items there may be none.

During the brief pause after each item, please circle on the "like-dislike" row for that item the number that best indicates your degree of like or dislike for that selection.

****

1. Exact Repetition ____

Altered Repetition ____ (13-14)

LIKE	7	6	5	4	3	2	1	DISLIKE	
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme		(15)

2. Exact Repetition ____

Altered Repetition ____ (16-17)

LIKE	7	6	5	4	3	2	1	DISLIKE	
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme		(18)

3. Exact Repetition ____

Altered Repetition ____ (19-20)

LIKE	7	6	5	4	3	2	1	DISLIKE	
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme		(21)

4. Exact Repetition ____

Altered Repetition ____ (22-23)

LIKE	7	6	5	4	3	2	1	DISLIKE	
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme		(24)

5. Exact Repetition ____

Altered Repetition ____ (25-26)

LIKE	7	6	5	4	3	2	1	DISLIKE	
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme		(27)

6. Exact Repetition ______

Altered Repetition ______ (28-29)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (30)

7. Exact Repetition ______

Altered Repetition ______ (31-32)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (33)

8. Exact Repetition ______

Altered Repetition ______ (34-35)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (36)

9. Exact Repetition ______

Altered Repetition ______ (37-38)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (39)

10. Exact Repetition ______

Altered Repetition ______ (40-41)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (42)

11. Exact Repetition ______

Altered Repetition ______ (43-44)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (45)

12. Exact Repetition ______

Altered Repetition ______ (46-47)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (48)

13. Exact Repetition ______

Altered Repetition ______ (49-50)

LIKE 7 6 5 4 3 2 1 DISLIKE
Extreme Moderate Mild Neutral Mild Moderate Extreme (51)

14. Exact Repetition ____________________

Altered Repetition ____________________ (52-53)

LIKE	7	6	5	4	3	2	1	DISLIKE	
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme		(54)

15. Exact Repetition ____________________

Altered Repetition ____________________ (55-56)

LIKE	7	6	5	4	3	2	1	DISLIKE	
	Extreme	Moderate	Mild	Neutral	Mild	Moderate	Extreme		(57)

****

Section III (Card 2)

16. **How well do you like Rock and Roll music?**

LIKE	7	6	5	4	3	2	1	**DISLIKE**
	Extreme	**Moderate**	**Mild**	**Neutral**	**Mild**	**Moderate**	**Extreme**	

17. **How well do you like music that is currently popular?**

LIKE	7	6	5	4	3	2	1	**DISLIKE**
	Extreme	**Moderate**	**Mild**	**Neutral**	**Mild**	**Moderate**	**Extreme**	

18. **How well do you like Folk music?**

LIKE	7	6	5	4	3	2	1	**DISLIKE**
	Extreme	**Moderate**	**Mild**	**Neutral**	**Mild**	**Moderate**	**Extreme**	

19. **How well do you like Jazz music?**

LIKE	7	6	5	4	3	2	1	**DISLIKE**
	Extreme	**Moderate**	**Mild**	**Neutral**	**Mild**	**Moderate**	**Extreme**	

20. **How well do you like Classical music?**

LIKE	7	6	5	4	3	2	1	**DISLIKE**
	Extreme	**Moderate**	**Mild**	**Neutral**	**Mild**	**Moderate**	**Extreme**	

APPENDIX D

Like-Dislike Reliability Data -- Third Pilot Study

LIKE-DISLIKE RELIABILITY DATA

Item	Subject and Test																			
	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B
1	5	5	6	7	6	7	7	7	7	5	7	5	6	5	7	7	5	6	7	7
2	5	6	5	7	7	7	7	7	5	5	5	6	7	6	7	7	5	5	7	7
3	6	5	4	5	7	6	1	1	4	4	3	3	6	7	7	7	5	5	7	7
4	7	5	4	6	6	7	5	6	6	7	6	6	5	6	7	7	7	7	7	6
5	6	4	5	4	5	5	5	6	6	6	5	4	6	5	7	7	7	6	6	6
6	7	6	5	7	6	4	5	2	2	3	4	5	7	5	7	6	7	7	6	7
7	7	4	6	4	6	2	5	5	2	3	4	5	4	5	7	6	6	5	6	6
8	7	6	6	7	7	7	7	7	5	5	5	7	6	7	7	7	7	7	7	7
9	5	3	6	4	5	6	5	1	5	5	6	5	5	5	6	6	7	3	6	6
10	7	5	6	5	6	5	7	6	4	5	6	6	4	5	6	6	7	4	7	6
11	5	4	7	4	5	2	1	5	3	3	6	4	2	3	6	5	4	4	7	4
12	6	5	7	5	6	6	6	5	4	5	6	6	5	5	6	7	7	6	7	7
13	6	3	7	6	7	6	5	7	4	3	5	4	6	4	6	5	3	3	6	5
14	7	6	6	4	5	5	7	7	5	5	7	7	4	7	7	6	7	7	7	7
15	7	4	6	5	6	2	6	5	3	4	4	4	7	6	7	6	7	7	7	7

LIKE-DISLIKE RELIABILITY DATA (continued)

Item	Subject and Test															
	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B
1	6	6	7	6	6	7	6	5	6	6	7	7	7	7	6	6
2	5	6	6	6	7	6	6	7	7	7	6	7	6	7	5	5
3	7	7	3	1	7	5	6	5	7	6	5	6	6	7	4	4
4	6	6	7	4	5	7	7	7	7	7	7	7	7	6	6	7
5	4	4	4	1	5	5	7	7	7	6	7	7	5	5	5	6
6	4	5	2	5	5	4	6	6	6	6	4	7	5	5	3	3
7	6	5	4	4	7	5	5	5	6	7	5	6	5	6	5	5
8	6	6	5	7	7	7	7	7	7	7	7	7	6	6	7	5
9	6	5	4	2	7	6	7	6	7	7	5	5	5	6	7	7
10	6	5	3	2	6	7	7	5	6	5	5	5	7	7	7	6
11	5	5	2	4	6	3	6	4	6	6	4	5	5	4	2	2
12	5	6	4	5	6	6	7	6	7	6	7	6	6	7	6	6
13	7	6	7	3	7	6	6	6	6	6	4	3	7	6	4	4
14	6	6	5	6	6	6	7	7	7	7	7	7	6	6	6	6
15	7	7	4	6	6	7	5	6	7	7	6	7	7	7	3	4

APPENDIX E

Mann-Whitney U Data -- Effect of Familiarity

MANN WHITNEY U DATA: EFFECT OF FAMILIARITY

Recognition Scores Achieved by Music Majors who indicated Familiarity with One Item	Recognition Scores Achieved by Music Majors who indicated Familiarity with Seven or More Items
81	
72	
70	
68	
67	67
64	
64	
63	63
62	
61	
60	
59	
58	
57	57
57	
56	
54	54
53	
51	
50	
49	
47	47
46	
45	
43	44
40	
38	
36	
35	
26	26